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For Life and the Earth

SANYO

Discrete Devices

2008-6



Power & RF Devices

SANYO Semiconductor Co., Ltd.

SANYO Discrete Devices

SANYO's environmentally-considered discrete "ECoP"
contributes to the realization of comfortable life in
various aspects.

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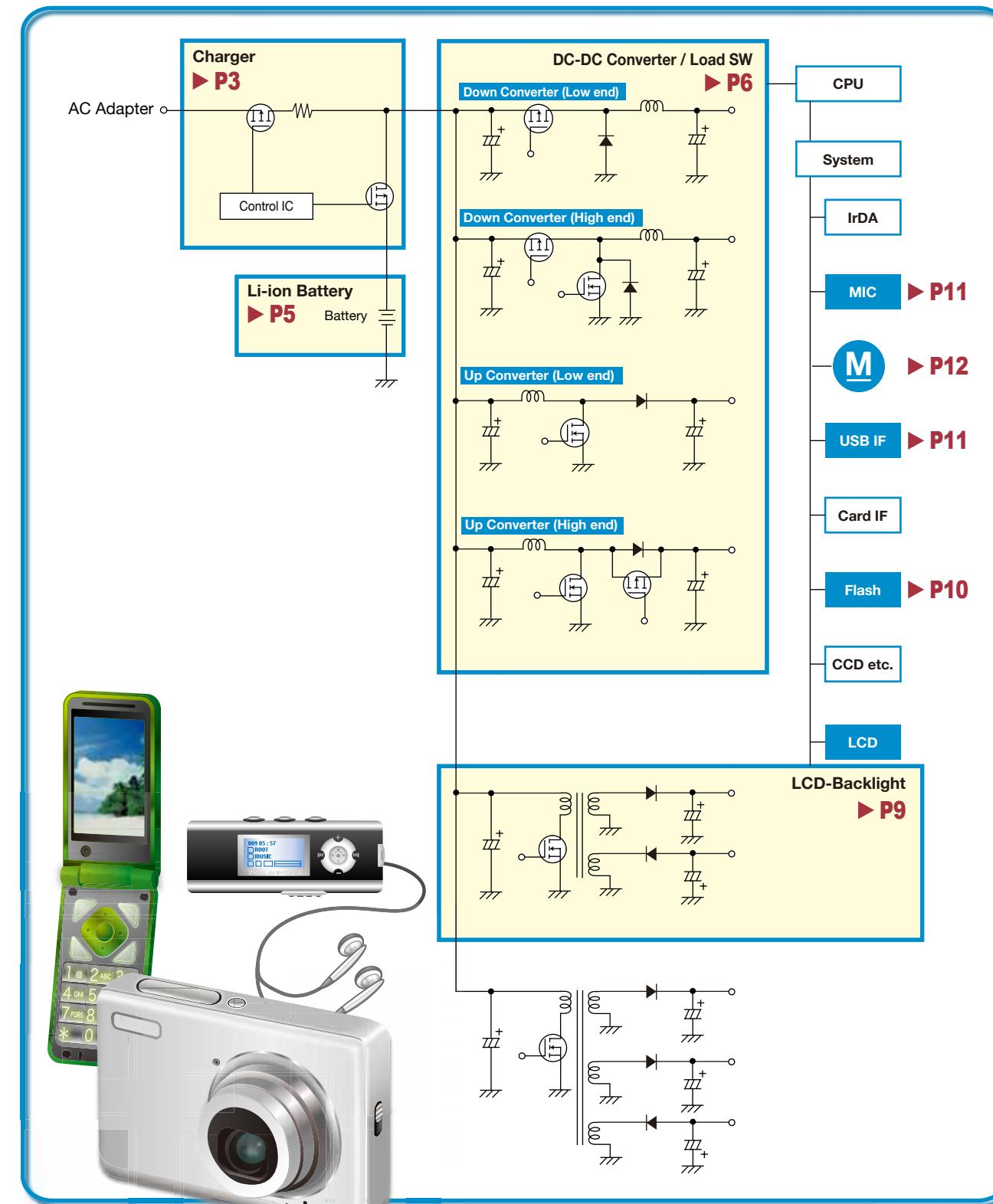


We provide discrete solutions based on "**LIGHT, FAST, EFFICIENT & FRIENDLY**" concept to contribute to the creation of "Symbiosis Next-generation Electronic Devices" aiming at the realization of better life.

Power & RF Devices

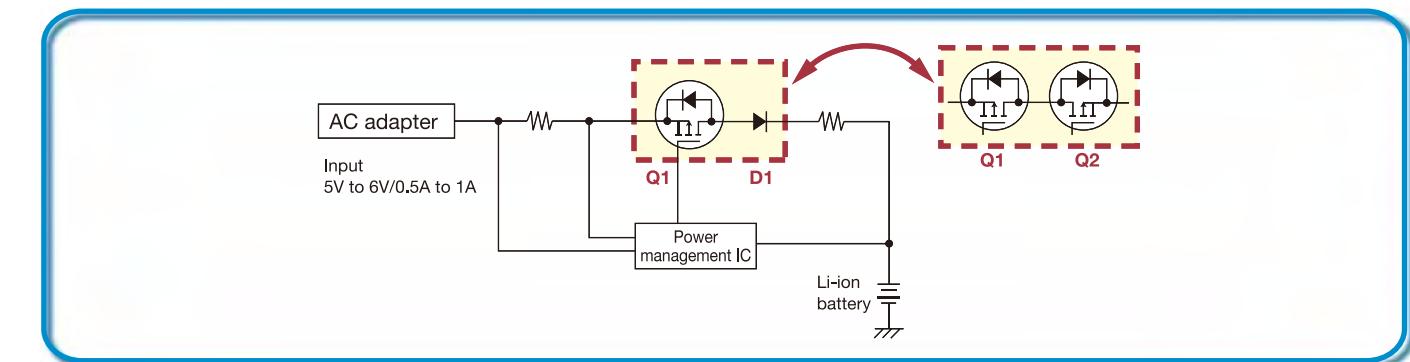
Devices for Mobile Equipment

■ Application Block



■ Charger

[GSM]

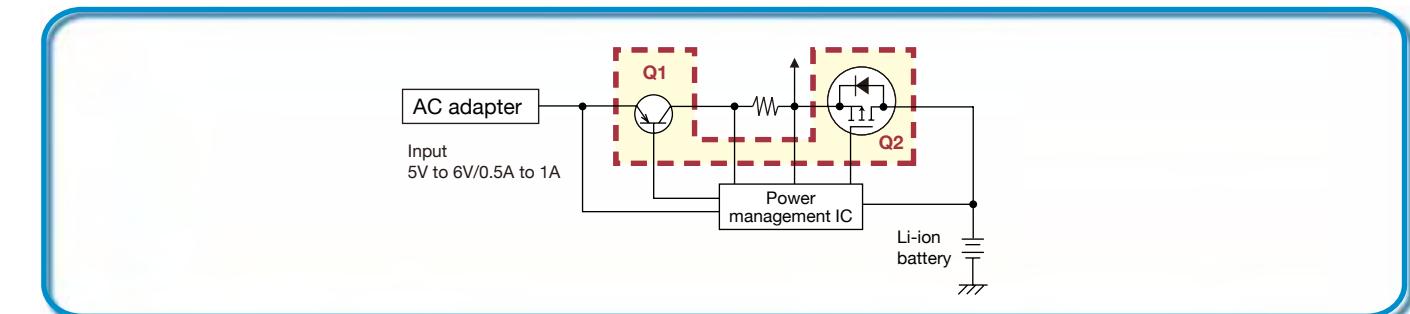


MOSFETs (Pch) + Schottky Barrier Diodes (or MOSFETs (Pch))

	Type No.	Package	2 in 1	Absolute maximum ratings/Ta=25°C				Electrical characteristics/Ta=25°C			
				V _{DSS} /V _R [V]	V _{GSS} [V]	I _D /I _O [A]	P _D [W]	R _{D(on)} [Ω] V _{GS} =2.5V	I _F [A]	V _F [V]	
Q1+D1	CPH5802	CPH5	Pch MOS	20	±10	2	0.9	0.140	0.200	-	-
			SBD	15	-	1	-	-	-	1	0.35
	VEC2822		Pch MOS	20	±10	3.5	1	0.077	0.108	-	-
			SBD	15	-	2	-	-	-	2	0.5
Q1+Q2	VEC2818	VEC8	Pch MOS	20	±10	3.5	1	0.077	0.108	-	-
			SBD	30	-	2	-	-	-	2	0.45
	VEC2303	VEC8	Pch MOS	12	±8	4	0.9	0.054	0.075	-	-
	VEC2301		Pch MOS	20	±10	3	0.9	0.087	0.120	-	-
Q1+Q2	ECH8654	ECH8	Pch MOS	20	±10	5	1.3	0.041	0.058	-	-
	ECH8611		Pch MOS	12	±9	5	1.3	0.045	0.065	-	-
	* ECH8652		Pch MOS	12	±10	6	1.3	0.031	0.045	-	-

*: Development

[CDMA]



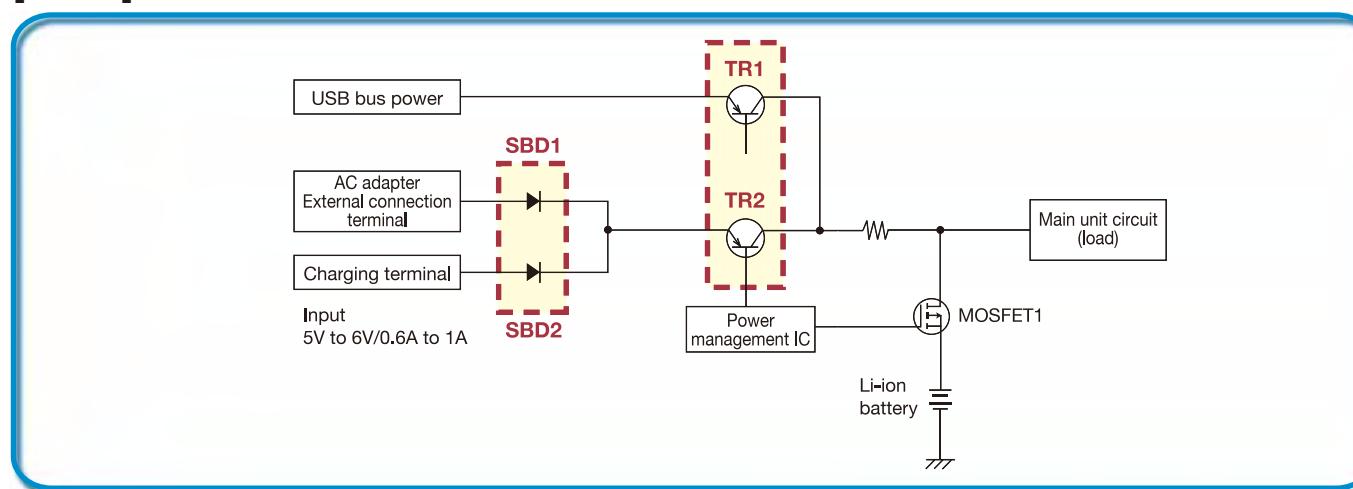
Transistors (PNP) + MOSFETs (Pch)

	Type No.	Package	2 in 1	Absolute maximum ratings/Ta=25°C			Electrical characteristics/Ta=25°C				
				V _{CEO} /V _{DSS} [V]	I _C /I _D [A]	P _C P _D [W]	V _{CE(sat)} [V]		R _{D(on)} [Ω] V _{GS} =2.5V		
Q1+Q2	VEC2904	VEC8	PNP TR	30	3	1.1	1.5	75	0.11	0.16	-
			Pch MOS	12	4	1.1	-	-	-	-	0.054
	VEC2905		PNP TR	30	3	1.1	1.5	75	0.11	0.16	-
			Pch MOS	20	3	1.1	-	-	-	-	0.087
Q1	CPH6122	CPH6	PNP TR	30	3	1.3	1.5	75	0.120	0.180	-
	* MCH6122		PNP TR	30	3	1.0	1.5	75	0.120	0.180	-
	* VEC1106		PNP TR	30	5	1.4	1.5	75	0.105	0.155	-
Q2	MCH6320	MCPH6	Pch MOS	12	5	1.5	-	-	-	-	0.047
	MCH6321		Pch MOS	20	4	1.5	-	-	-	-	0.072
	MCH6336		Pch MOS	12	5	1.5	-	-	-	-	0.047
	MCH6337		Pch MOS	20	4.5	1.5	-	-	-	-	0.053
	ECH8304	ECH8	Pch MOS	12	9.5	1.6	-	-	-	-	0.018
	ECH8301		Pch MOS	20	8	1.6	-	-	-	-	0.026
	EMH1303	EMH8	Pch MOS	12	7	1.5	-	-	-	-	0.027

*: Development

Devices for Mobile Equipment

[CDMA]



Recommended Bipolar Transistors (PNP)

V _{CEO} [V]	I _C [A]	MCPH3	MCPH6	CPH3	CPH6	VEC8	VEC8(2 in 1)
-12	2.5	MCH3143		CPH3143		* VEC1105	
	3.0	MCH3106		CPH3121	CPH6121	* VEC1104	
-15	6.0			CPH3107			
	2.0	MCH3144		CPH3144			
-30	3.0	MCH3109	* MCH6122	CPH3122	CPH6122		VEC2102
	5.0			CPH3110		* VEC1106	

*: Development

Recommended Schottky Barrier Diodes (Single)

[Features]

- Package size: 1.6×0.8mm and I_O=1A, Minimum in industry size !
- Thickness of Package: Typ. 0.60mm

V _R [V]	I _O [A]	ECSP1008-2	ECSP1608-4
30	0.2		SS0203EJ SB0203EJ
	0.5	SS0503EC SB0503EC	SS0503EJ SB0503EJ
	1.0		SS1003EJ SB1003EJ

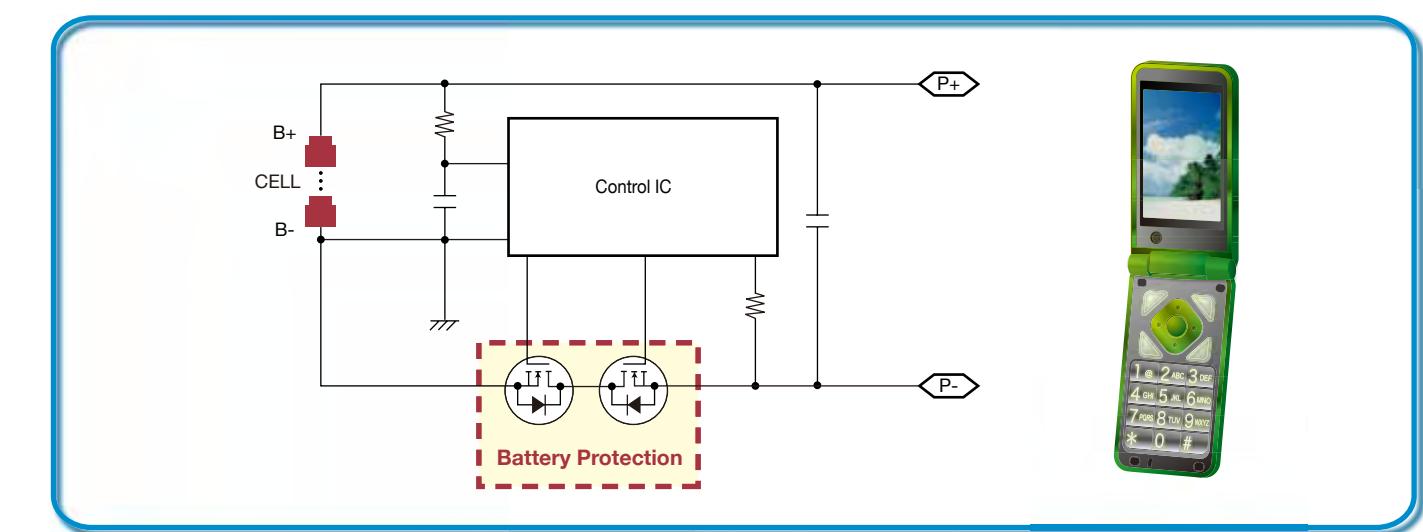
Recommended Schottky Barrier Diodes (2 in 1: Parallel type)

[Features]

- Package size: 2.8×2.9mm and 30V/3A [SBS813/SBE813]
- Package size: 2.0×2.1mm and 30V/2A [SBS818], 15V/2A [SBS817]
- Thickness of Package: Typ. 0.75mm

V _R [V]	I _O [A]	MCPH5	EMH8	CPH5	VEC8
15	1.0	SBS808M SBE808		SBS804	
	2.0		SBS817 * SBE817		
30	0.5	SBS806M		SBE805	
	1.0	* SBS810		SBE807	SBS814
	2.0		SBS818 * SBE818		SBS811 SBE811
	3.0				SBS813 SBE813

■ Li-ion Battery



Recommended MOSFETs (Nch)

V _{DSS} [V]	EMH8	ECH8	TSSOP8	SOP8
20	EMH2405 EMH2407	ECH8601R ECH8649 ECH8651R	FTD2011A FTD2017R	FW231A FW232A
	EMH2402	ECH8622R	FTD2019A	

Recommended MOSFETs for Machine Tools

V _{DSS} [V]	Polarity	SMP	ZP	Drive
30	Nch		2SK4163	1.8V Drive
	Pch		TM1829Z	
45	Nch		2SK4164	4.0V Drive
	Pch		TM1831Z	
60	Nch	2SK4066	2SK4044	
	Pch		2SJ683	
75	Nch	2SK4065	2SK4165	
	Pch		2SJ686	
80	Nch		2SK4045	
	Pch		2SJ684	
100	Pch			

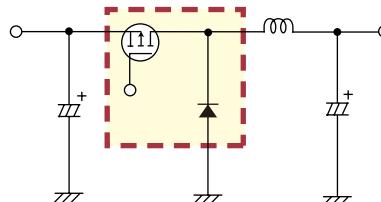
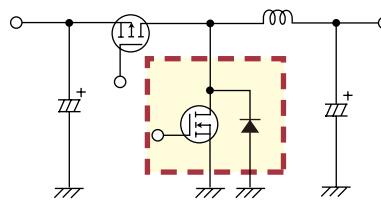
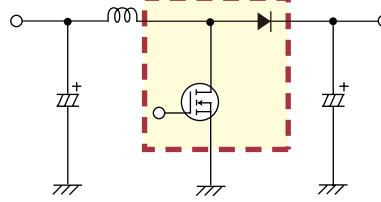


Devices for Mobile Equipment

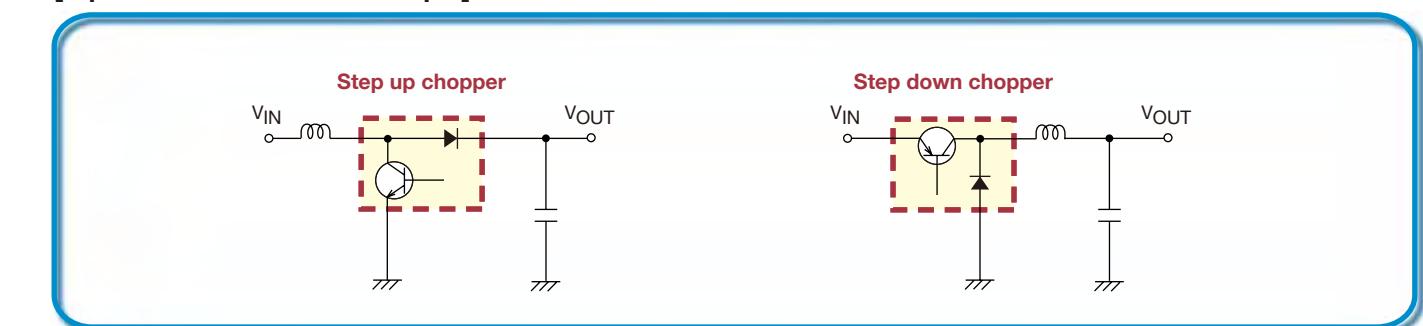
■ DC-DC Converter/Load SW

(1) DC-DC Converter

Recommended MOSFETs

Back Converter (Step Down)	Package	Type No.	V _{DSS} [V]	R _{DS(on)} max [mΩ] V _{GS} =4V (*: V _{GS} =4.5V)	Drive [V]	SBD
	SCH6	SCH2809	-12	290*	1.8	15V/0.5A
		SCH2810		530	2.5	
		SCH2811	-30	830	4.0	
	MCPH5	MCH5815	-12	290*	1.8	15V/0.5A
		MCH5818		530		
		MCH5802	-30	1090	4.0	30V/0.5A
		MCH5805	-60	2300		
	CPH5	CPH5812	-12	290*	1.8	15V/2A
		CPH5815		290*		
		CPH5818		490*	4.0	15V/0.5A
		CPH5802	-20	145	1.8	
		CPH5835		235	2.5	
	VEC8	CPH5822	-30	290	4.0	30V/0.5A
		VEC2811	-30	168	4.0	30V/2A
		VEC2817	-12	62*	2.5	15V/3A
Synchronous Back Converter (Pch + Nch or Nch + Nch)	Package	Type No.	V _{DSS} [V]	R _{DS(on)} max [mΩ] V _{GS} =4V (*: V _{GS} =4.5V)	Drive [V]	SBD
	SCH6	SCH1305	-12	310*	1.8	-
		SCH1406	20	210		
		SCH2806		440	4.0	15V/0.5A
		SCH2816				
	MCPH3/5	MCH3317	-12	290*	1.8	-
		MCH3456	15	160		
		MCH5811	20	210	15V/1A	30V/0.5A
		MCH5819	30	520		
	CPH3/5	CPH3321	-12	98*	1.8	-
		CPH3313	-20	235	2.5	
		CPH3337	-30	77	4.0	
		CPH5809	30	90	2.5	30V/0.5A
		CPH5819	30	520		
		CPH5805	30	150	4.0	
Boost Converter (Step Up)	Package	Type No.	V _{DSS} [V]	R _{DS(on)} max [mΩ] V _{GS} =4V	Drive [V]	SBD
	SCH6	SCH2817	15	160	1.8	15V/0.5A
		SCH2806	20	210		
		SCH2819	30	215	2.5	30V/0.5A
		SCH2808		560	4.0	
	MCPH5	MCH5826	15	160		15V/0.5A
		MCH5811	20	210		15V/1A
		MCH5809	30	215	2.5	30V/0.5A
		Mch5819		520	4.0	
	CPH5	CPH5803		210	1.8	15V/1A
		CPH5811		63		15V/2A
		CPH5831		63		
		CPH5809	30	90	2.5	30V/0.5A
		CPH5819		520		
		CPH5805		150	4.0	
	VEC8	VEC2813	20	66	1.8	30V/2A
		VEC2816	30	99	4.0	

[Bipolar Transistor Use Example]



Bipolar Transistors + Schottky Barrier Diodes

Type No.	Package	Absolute maximum ratings/Ta=25°C					Electrical characteristics/Ta=25°C								Internal chip equivalent product	Electrical connection					
		TR		SBD			TR				SBD										
		V _{CCEO} [V]	I _C [A]	P _C [W]	V _{RRM} [V]	I _O [A]	V _C [V]	I _C [A]	min	max	I _C [A]	I _B [mA]	V _F [V]	I _R [μA]	t _{rr} [ns]						
CPH5706	CPH5	30	1.5	0.9	30	0.7	2	0.1	200	560	0.75	15	0.25	0.375	0.7	0.55	10	200	0.1	10	CPH3115 +SBS006
		30	3	0.9	15	1	2	0.5	200	560	1.5	30	0.155	0.23	0.5	0.35	6	500	0.1	15	CPH3109 +SBS004
		30	3	0.9	30	0.7	2	0.5	200	560	1.5	30	0.12	0.18	0.7	0.55	15	80	0.1	10	CPH3209 +SB07-03C
		50	3	0.9	50	0.5	2	0.1	200	560	1	50	0.08	0.12	0.5	0.55	25	50	0.1	10	CPH3205 +SB05-05CP

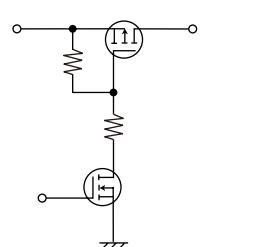
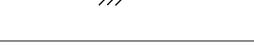
Bipolar Transistors (PNP)

Type No.	Package	Absolute maximum ratings/Ta=25°C			Electrical characteristics/Ta=25°C								Complementary product		
		V _{CCEO} [V]	I _C [A]	P _C [W]	hFE		V _{CE} (sat) [V]				IC		IB		
					min	max	typ	max	IC [A]	IB [mA]	typ	max	typ	max	
MCH3144	MCPH3	30	2	0.8 *1	200	560	1.5	75	0.17	0.26	0.16	0.24	0.16	0.24	MCH3244
		30	3	0.8 *1	200	560	1.5	30	0.155	0.23	0.15	0.23	0.15	0.23	MCH3209
		50	2	0.8 *1	200	560	1	50	0.165	0.33	0.16	0.33	0.16	0.33	MCH3245
		50	3	0.8 *1	200	560	1	50	0.06	0.09	0.06	0			

Devices for Mobile Equipment

(2) Load SW

Recommended MOSFETs

VDSS	MCPH6	CPH6	VEC8	EMH8	Application Sample: Pch + Nch
20V	MCH6628	CPH6605	-	EMH2603	
30V	MCH6614	CPH6615	VEC2612	EMH2602	

Power MOSFETs (Pch + Nch)

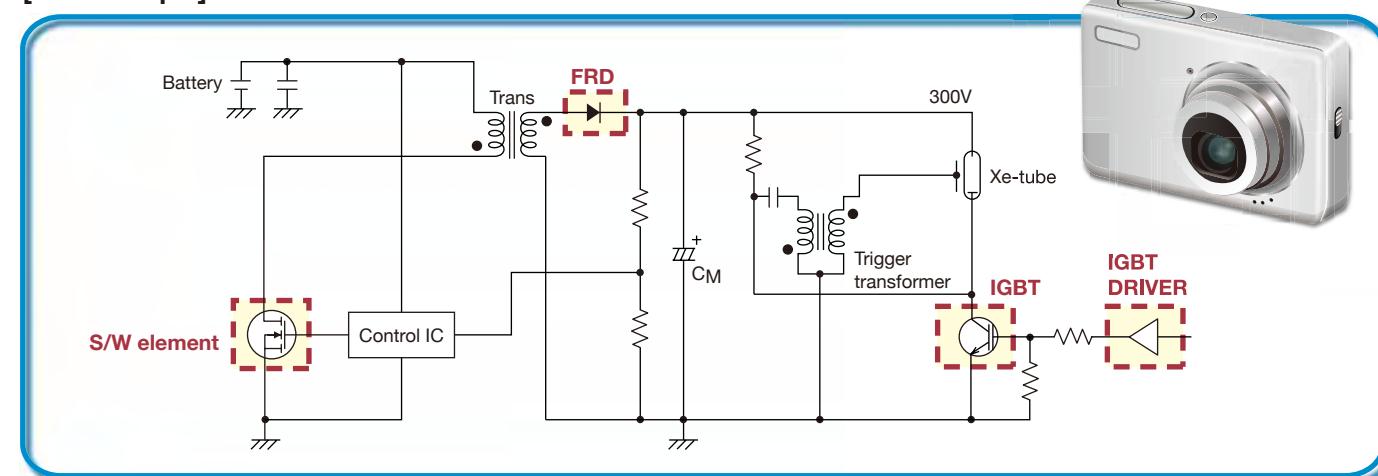
●: New products

Type No.	Package	Polarity	Absolute maximum ratings/Ta=25°C				Electrical characteristics/Ta=25°C				Electrical connection		
			VDSS [V]	VGSS [V]	ID [A]	PD [W]	RDS (on) [Ω]		Ciss [pF]	Qg [nC]			
							VGS=10V typ	VGS=4(4.5)V max					
● MCH6627	MCPH6	Pch	30	20	1	0.8	0.42	0.55	0.72	1	75	2.6	M11
		Nch	30	20	1.4	0.8	0.23	0.3	0.4	0.56	65	2.5	
		Pch	30	20	1.2	0.8	0.32	0.42	0.59	0.83	104	3.3	M11
		Nch	30	20	1.8	0.8	0.16	0.21	0.3	0.42	95	3.2	
		Pch	20	10	1	0.8	0.38	0.5	0.54	0.76	115	1.5	M11
		Nch	30	10	0.35	0.8	2.9	3.7	3.7	5.2	7	1.58	
		Pch	30	10	0.2	0.8	8	10.4	11	15.4	7.5	1.43	M11
		Nch	30	10	0.35	0.8	2.9	3.7	3.7	5.2	7	1.58	
		Pch	30	10	0.2	0.8	2.4	3.1	3.5	4.9	28	2	M11
		Nch	30	10	0.35	0.8	2.9	3.7	3.7	5.2	7	1.58	
MCH6613	MCH6614	Pch	30	10	0.4	0.8	2.4	3.1	3.5	4.9	28	2	M11
		Nch	30	10	0.4	0.8	2.4	3.1	3.5	4.9	28	2	
		Pch	30	10	0.4	0.8	2.4	3.1	3.5	4.9	28	2	M11
		Nch	30	10	0.4	0.8	2.4	3.1	3.5	4.9	28	2	
		Pch	30	10	0.4	0.8	2.4	3.1	3.5	4.9	28	2	M11
		Nch	30	10	0.4	0.8	2.4	3.1	3.5	4.9	28	2	
		Pch	30	10	0.4	0.8	2.4	3.1	3.5	4.9	28	2	M11
		Nch	30	10	0.4	0.8	2.4	3.1	3.5	4.9	28	2	
		Pch	30	10	0.4	0.8	2.4	3.1	3.5	4.9	28	2	M11
		Nch	30	10	0.4	0.8	2.4	3.1	3.5	4.9	28	2	
MCH6615	MCH6634	Pch	30	10	0.4	0.8	1.5	1.9	2	2.8	40	0.83	M11
		Nch	30	10	0.4	0.8	1.5	1.9	2	2.8	40	0.83	
		Pch	30	10	0.4	0.8	1.5	1.9	2	2.8	40	0.83	M11
		Nch	30	10	0.4	0.8	1.5	1.9	2	2.8	40	0.83	
		Pch	30	10	0.4	0.8	1.5	1.9	2	2.8	40	0.83	M11
		Nch	30	10	0.4	0.8	1.5	1.9	2	2.8	40	0.83	
		Pch	30	10	0.4	0.8	1.5	1.9	2	2.8	40	0.83	M11
		Nch	30	10	0.4	0.8	1.5	1.9	2	2.8	40	0.83	
		Pch	30	10	0.4	0.8	1.5	1.9	2	2.8	40	0.83	M11
		Nch	30	10	0.4	0.8	1.5	1.9	2	2.8	40	0.83	
● CPH6614	CPH6	Pch	30	20	1.2	0.8	0.32	0.42	0.59	0.83	104	3.3	M12
		Nch	30	20	1.8	0.8	0.15	0.195	0.29	0.41	95	3.2	
		Pch	30	20	1.8	0.9	0.18	0.235	0.32	0.45	226	5.5	M12
		Nch	30	20	2.5	0.9	0.079	0.105	0.15	0.21	187	5.2	
		Pch	20	10	1.5	0.8	0.18	0.235	0.24	0.34	40	3.2	M07
		Nch	30	10	0.65	0.8	0.9	1.2	1.2	1.7	30	2.34	
		Pch	30	9	0.4	0.8	1.4	1.8	2	2.8	40	0.83	M07
		Nch	30	20	1.4	0.8	0.245	0.32	0.415	0.58	65	2.5	
		Pch	30	20	3	0.9	0.065	0.086	0.117	0.168	510	11	M13
		Nch	30	20	4	0.9	0.037	0.048	0.07	0.099	370	8.5	
● VEC2602	VEC8	Pch	30	20	3	0.9	0.065	0.086	0.117	0.168	510	11	M13
		Nch	30	20	4	0.9	0.037	0.048	0.07	0.099	370	8.5	
		Pch	30	20	3	0.9	0.073	0.095	0.115	0.161	180	4.9	M13
		Nch	30	20	3	0.9	0.065	0.086	0.117	0.168	510	11	
		Pch	30	20	2	1	0.053	0.069	0.105	0.15	280	6.4	M13
		Nch	30	20	3.5	1	0.115	0.15	0.215	0.31	285	6.7	
		Pch	20	10	2	1.1	0.165	0.235	0.26	0.52	420	5	M30
		Nch	30	10	0.15	0.6	3.7	5.2	6.4	12.8	7	2	
		Pch	12	10	1.5	0.6	-	-	0.235	0.31	160	2.6	M26
		Nch	30	10	0.35	0.6	-	-	2.9	3.7	7	1.58	
M07		M11		M12		M13		M26		M30			
<img alt="Pin configuration for M07 device." data-bbox="45 8													

Devices for Mobile Equipment

■ Flash Unit

[Use Example]



Bipolar Transistors (NPN)

Type No.	Package	Polarity	Absolute maximum ratings/Ta=25°C			Electrical characteristics/Ta=25°C					
			VCEO [V]	IC [A]	PC [W]	hFE		VCE (sat) [V]		IC [A]	IB [mA]
CPH3223	CPH	NPN	50	3	0.9	200	560	1	50	0.09	0.13
CPH3236		NPN	50	3	0.9	250	400	1	50	0.06	0.1

MOSFETs (Nch)

Type No.	Package	Polarity	Absolute maximum ratings/Ta=25°C			Electrical characteristics/Ta=25°C						
			V _{DSS} [V]	V _{GSS} [V]	I _D [A]	P _D [W]	R _{D(S)} (on) [Ω]			C _{iss} [pF]	Q _g [nC]	
● MCH6422	MCPH6	Nch	60	10	2	1.5	-	-	0.17	0.22	0.19	0.27
MCH6424		Nch	60	10	3	1.5	-	-	0.085	0.115	0.095	0.135
● MCH6423		Nch	60	20	2	1.5	0.17	0.22	0.21	0.3	-	-
●: New products												
EC4K11KF	ECSP1410 (1.4×1.0×0.4)	ECSP1410 (1.4×1.0×0.32)	±0.5	4	100	2	3.6	2.7	140	100	12	-90
EC4K14MF			±0.5	4	100	2	3.6	2.7	140	200	12	-90

Bipolar Transistors (NPN) + MOSFETs (Nch)

Type No.	Package	Absolute maximum ratings/Ta=25°C						Electrical characteristics/Ta=25°C													
		TR		MOSFET				TR		MOSFET											
		V _{CCEO} [V]	I _C [A]	P _C [W]	V _{DSS} [V]	V _{GSS} [V]	I _D [A]	P _D [W]	hFE	Cob	V _{C(E)} (sat) [V]	R _{D(S)} (on) [Ω]	C _{iss} [pF]	Q _g [nC]							
VEC2901	VEC8	50	5	1.1	30	10	0.15	0.25	250	400	26	1.6	53	0.055	0.11	2.9	3.7	3.7	5.2	7	1.58

IGBT Drivers

Type No.	Package	V _{DD} [V]		V _{IN} / V _{OUT} [V]		PD [W]	VIH min [V]	VIL max [V]	IO+/IO-typ [mA]		
		V _{DD} [V]		V _{IN} / V _{OUT} [V]					V _{DD} =5V		
TND721MH5	MCPH5	-0.3 to 7.5	-0.3 to V _{DD} +0.3	0.8	2	1	5000	50	5000	5000	10

Flash Circuit IGBTs

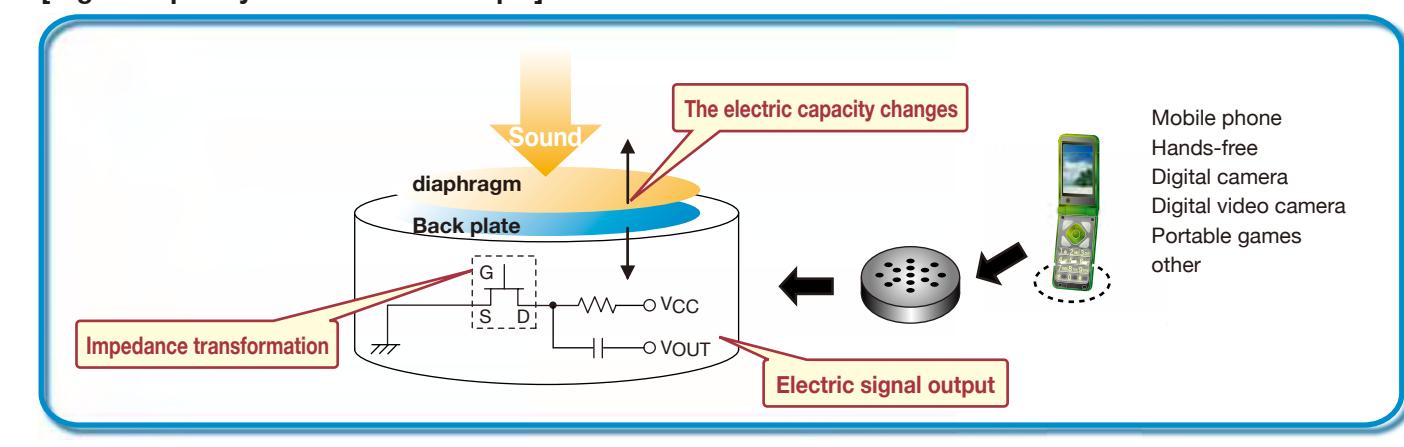
Type No.	Package	Polarity	Absolute maximum ratings/Ta=25°C			Electrical characteristics/Ta=25°C					
			VCES [V]	V _{GES} (DC) [V]	ICP [A]	V _{GE} (off) [V]			V _{C(E)} (sat) [V]		
						V _{CE} [V]	I _C [mA]	min max	I _C [A]	V _{GE} [V]	min max
● TIG030TS	TSSOP8	Nch	400	±6	150	10	1	0.5	1.2	150	4
● TIG032TS		Nch	400	±6	180	10	1	0.4	1	150	2.5
						3.7	5.4	10	1	2610	5100

FRD

Type No.	Package	VR [V]	IO [mA]	VF IF=0.1A [V]	IR VR=400V [μA]	t _{rr} max
RE0208DA	SOD-323	800	200	4.0	3	55

■ Condenser Microphone

[High-Frequency Devices Use Example]



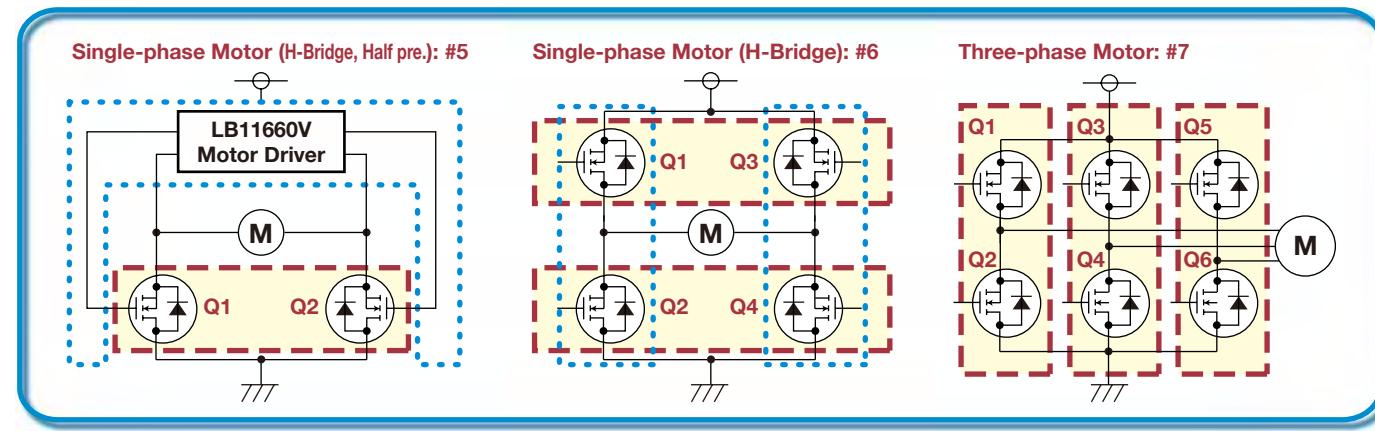
High-Frequency Devices for Condenser Microphone

Type No.	Package	Absolute maximum ratings/Ta=25°C			Electrical characteristics/Ta=25°C					
		V _{GDS} / V _{GDO} [V]	I _D [mA]	P _D [mW]	I _{DSS} [mA]	yfs typ (*min) [mS]	C _{iss} typ [pF]	C _{rss} typ [pF]	G _V typ [dB]	V _{NO} max [dB]
TF246	USFP	20	1	30	0.14	0.35	1.0	3.5	0.65	-3.0
TF252		20	1	30	0.14	0.35	1.4	3.1	0.95	1.0
TF202C	TSSFP	20	1	100	0.14	0.35	1.0	3.5	0.65	-3.0
TF222B		20	1	100	0.14	0.35	1.4	5.0	1.1	-2.0
TF218THC	VTFP	20	1	100	0.14	0.35	1.0	3.5	0.65</	

Devices for Mobile Equipment

■ Devices for Motor

[MOSFETs Use Example]



MOSFETs

Type No.	Package	Polarity	Absolute maximum ratings/Ta=25°C				Electrical characteristics/Ta=25°C					Use example	
			VDSS [V]	VGSS [V]	ID [A]	PD [W]	RDS (on) [Ω]		Ciss [pF]	Qg [nC]			
							VGS=10(15)V typ	VGS=4(4.5)V max					
MCH3410	MCPH3	Nch	30	20	2	0.9	0.115	0.15	0.19	0.27	120	3.6	#5
MCH3421		Nch	100	20	0.8	0.9	0.68	0.89	0.85	1.2	165	4.8	
MCH6423	MCPH6	Nch	60	20	2	1.5	0.17	0.22	0.21	0.3	220	6.4	
CPH3418	CPH3	Nch	30	20	1.4	0.9	0.23	0.3	0.4	0.56	65	2.5	
CPH3424		Nch	60	20	1.8	1	0.17	0.22	0.21	0.3	220	6.4	
CPH3427		Nch	100	20	1	1	0.48	0.63	0.58	0.81	240	6.5	
VEC2402	VEC8	Nch+Nch	30	20	4	0.9	0.037	0.048	0.07	0.099	370	8.5	
CPH6616	CPH6	Nch+Nch	30	20	2.5	0.9	0.079	0.105	0.15	0.21	187	5.2	

MOSFETs (Pch+Nch)

Type No.	Package	Polarity	Absolute maximum ratings/Ta=25°C				Electrical characteristics/Ta=25°C					Use example	
			VDSS [V]	VGSS [V]	ID [A]	PD [W]	RDS (on) [Ω]		Ciss [pF]	Qg [nC]			
							VGS=10V typ	VGS=4(4.5)V max					
VEC2602	VEC8	Pch	30	20	3	0.9	0.065	0.086	0.117	0.168	510	11	#6
		Nch	30	20	4	0.9	0.037	0.048	0.07	0.099	370	8.5	
ECH8609	ECH8	Pch	30	20	4	1.3	0.05	0.067	0.087	0.12	550	2.2	
		Nch	30	20	6	1.3	0.025	0.034	0.052	0.075	510	11	
FW340	SOP8	Pch	30	20	5	1.8	0.041	0.053	0.07	0.098	1000	16.5	
		Nch	30	20	5	1.8	0.037	0.048	0.064	0.09	460	8.6	
FW377		Pch	35	20	5	1.8	0.037	0.049	0.062	0.087	1224	24	
		Nch	35	20	6	1.8	0.025	0.033	0.043	0.061	1050	20	
FW356		Pch	60	20	3.5	2	0.11	0.145	0.15	0.21	990	22	#7
		Nch	60	20	5	2	0.043	0.058	0.056	0.084	790	16	
FW359	SOP8	Pch	60	20	3	1.8	0.11	0.145	0.145	0.205	990	22	#6
		Nch	60	20	3	1.8	0.11	0.145	0.15	0.215	300	7.8	
FW360		Pch	100	20	2	1.4	0.24	0.315	0.32	0.45	935	20	#6, #7
		Nch	100	20	2	1.4	0.175	0.22	0.22	0.31	530	13	

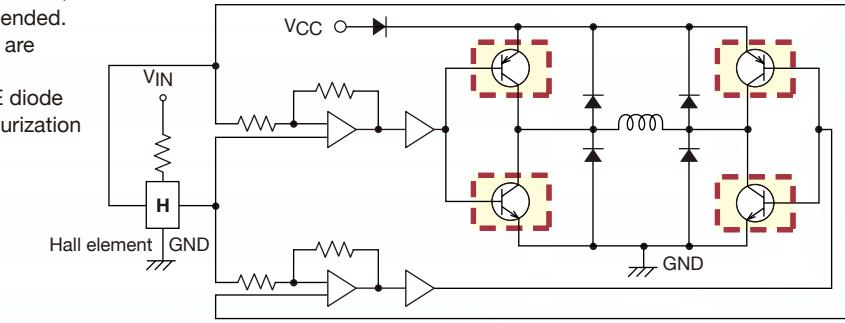
MOSFETs

Type No.	Package	Polarity	Absolute maximum ratings/Ta=25°C				Electrical characteristics/Ta=25°C					Use example	
			VDSS [V]	VGSS [V]	ID [A]	PD [W]	RDS (on) [Ω]		Ciss [pF]	Qg [nC]			
							VGS=10(15)V typ	VGS=4(4.5)V max					
2SJ646	TP	Pch	30	20	8	15	0.058	0.075	0.097	0.136	510	11	#6, #7
2SJ634		Pch	60	20	8	20	0.105	0.138	0.145	0.205	990	22	#7
2SJ637		Pch	100	20	5	20	0.24	0.312	0.32	0.45	935	20	#6, #7
2SK4067	TP	Nch	30	20	8	10	0.085	0.115	0.155	0.22	260	6	#6, #7
2SK3492		Nch	60	20	8	15	0.115	0.15	0.155	0.22	300	7.8	#7
2SK3617		Nch	100	20	6	15	0.18	0.225	0.225	0.315	530	13	

Devices for Fan Motor

[Bipolar Transistor Use Example]

- For the purpose of power consumption reduction, low saturated voltage transistor is recommended.
- PCP and TP packages with good radiation are recommended.
- Composite type (B-E bias resistor, and C-E diode are embedded) is recommended for miniaturization purpose.



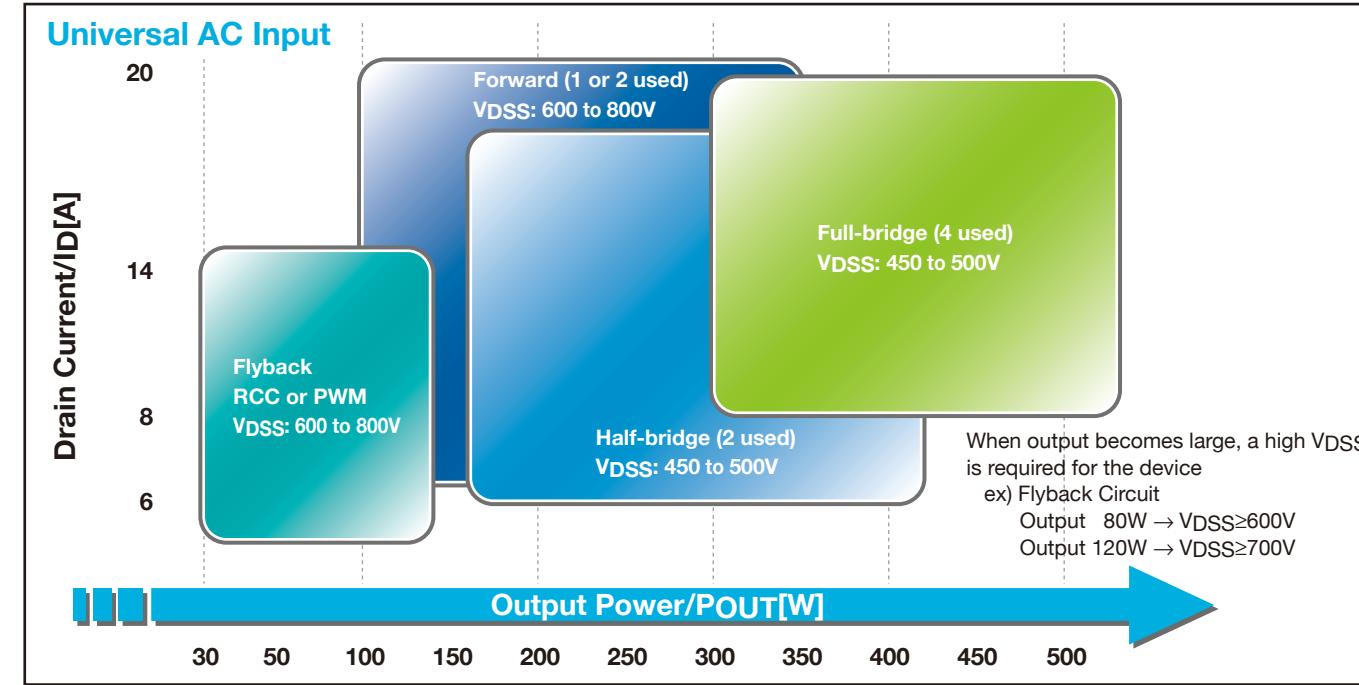
●: New products

Bipolar Transistors

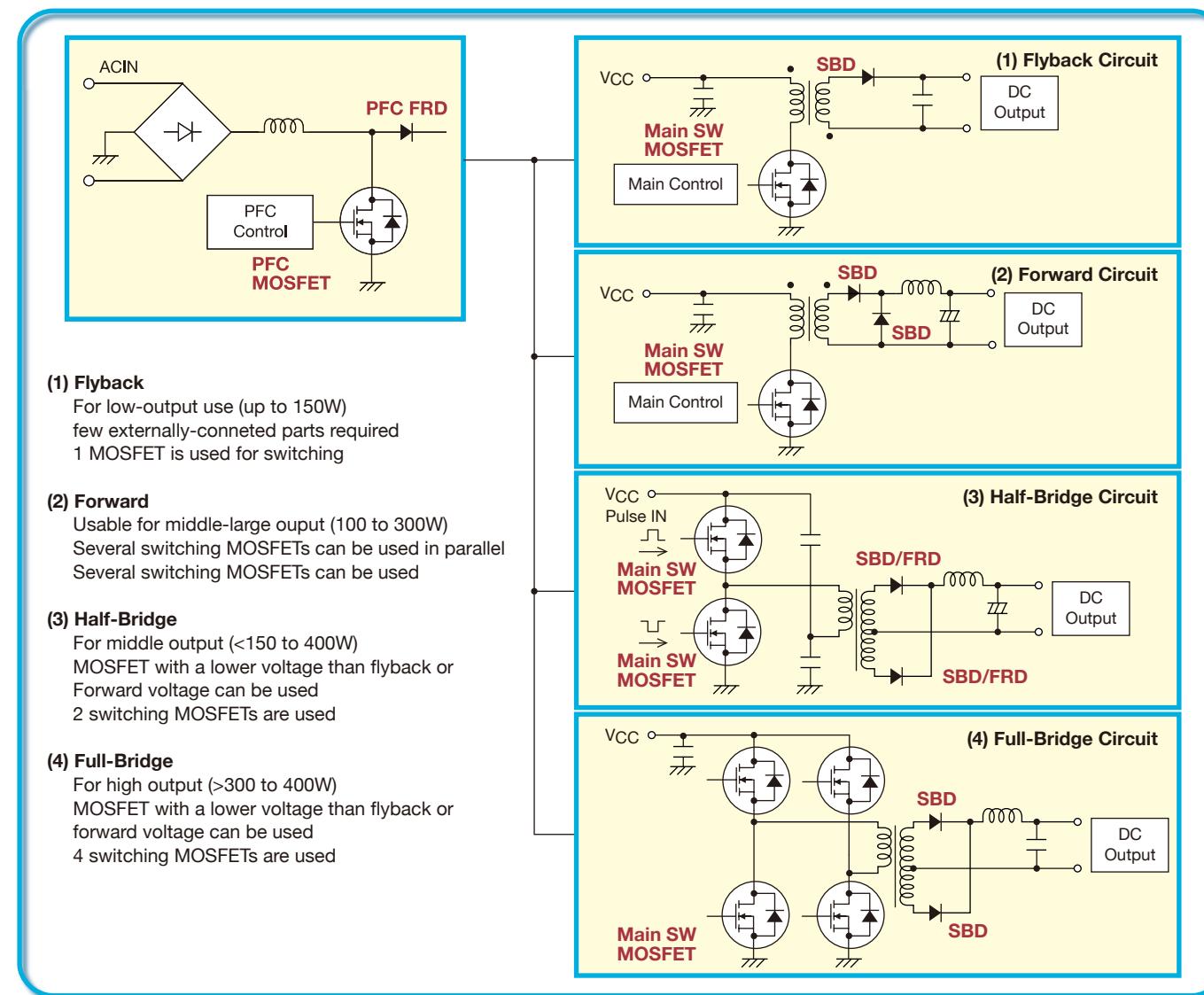
Type No.	Package	Polarity	Absolute maximum ratings/Ta=25°C				Electrical characteristics/Ta=25°C					Complementary product	
			VCEO [V]	IC [A]	PC [W]	hFE		VCE (sat) [V]					
						min	max	IC [A]	IB [mA]	typ	max		
● 2SA2124	PCP	PNP	30	2	1.3 *2	200	560	1.5	75	0.2	0.4	2SC6044</	

Devices for SW Power Supply

■ Switching Power Supply Types & Recommended Power MOSFETs Map

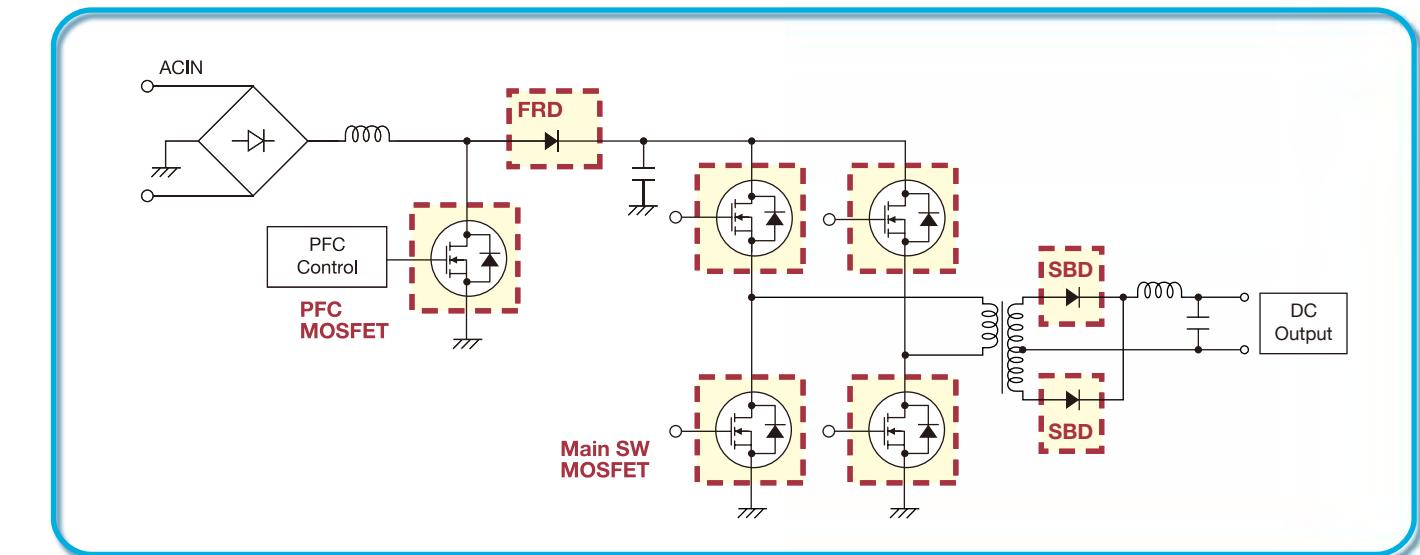


■ Application Example



■ Switching Devices

[MOSFET/FRD/SBD Use Example]



(1) Power MOSFET/SBD/FRD for Adapter

Recommended Devices

Applications/Power	Set Spec		PFC	Main SW	Rectifier
	VOUT [V]	IOUT [A]		MOSFET	
Game machine 50W	5	2.0 to 4.0	-	2SK4086LS (600V/0.58Ω)	SBT80-04J
	12	1.0 to 2.0			SBT100-16JS
Notebook PC 65W	20	2.0 to 4.0	-	2SK4087LS (600V/0.47Ω)	SBT100-16JS
	5	2.0 to 4.0			SBT80-04J
General-purpose 75 to 90W	12	3.0 to 5.0	2SK4085LS 500V/0.33Ω	2SK4087LS (600V/0.47Ω)	SBT150-10JS
	24				SBT100-16JS

(2) Power MOSFET/SBD/FRD for other power supply

Recommended Devices [Other sets]

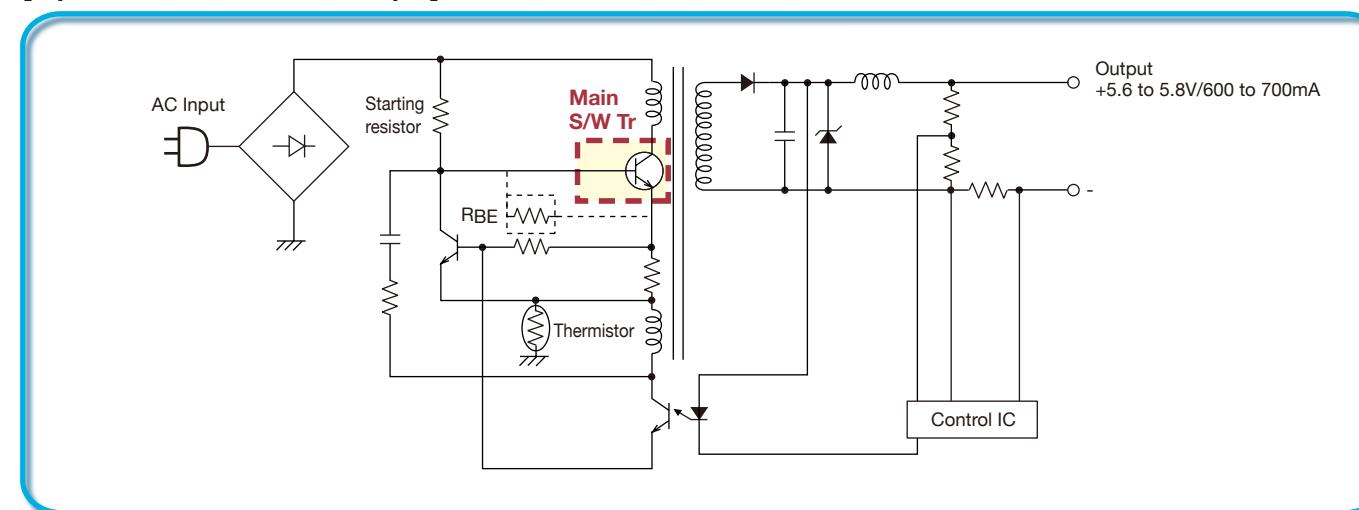
Set	Set Specification		PFC		Main SW	Rectifier
	Specification	Power [W]	FRD	MOSFET	MOSFET	SBD
Printer	Domestic (Japan)	50	-	-	2SK4096LS	SBT150-10JS
	W/W	50	-	-	2SK4098LS	SBT150-10JS
BL DVD recorder	Domestic (Japan)	100	* RD0506LS	2SK4097LS	2SK4087LS	SBT100-16JS
DVD recorder	Domestic (Japan)	60	-	-	2SK4097LS	SBT80-06J
Desktop PC	W/W	>200	* RD1006LS	2SK4085LS	2SK4125	SBT350-04J
PDP TV	W/W	>300	* RD1006LS	2SK4124	2SK4124	SBT100-16JS

*: Development

Devices for SW Power Supply

(3) Bipolar Transistors for Adapter

[Bipolar Transistor Use Example]



Bipolar Transistors [VCBO=700V/800V Series (AC Adapter)]

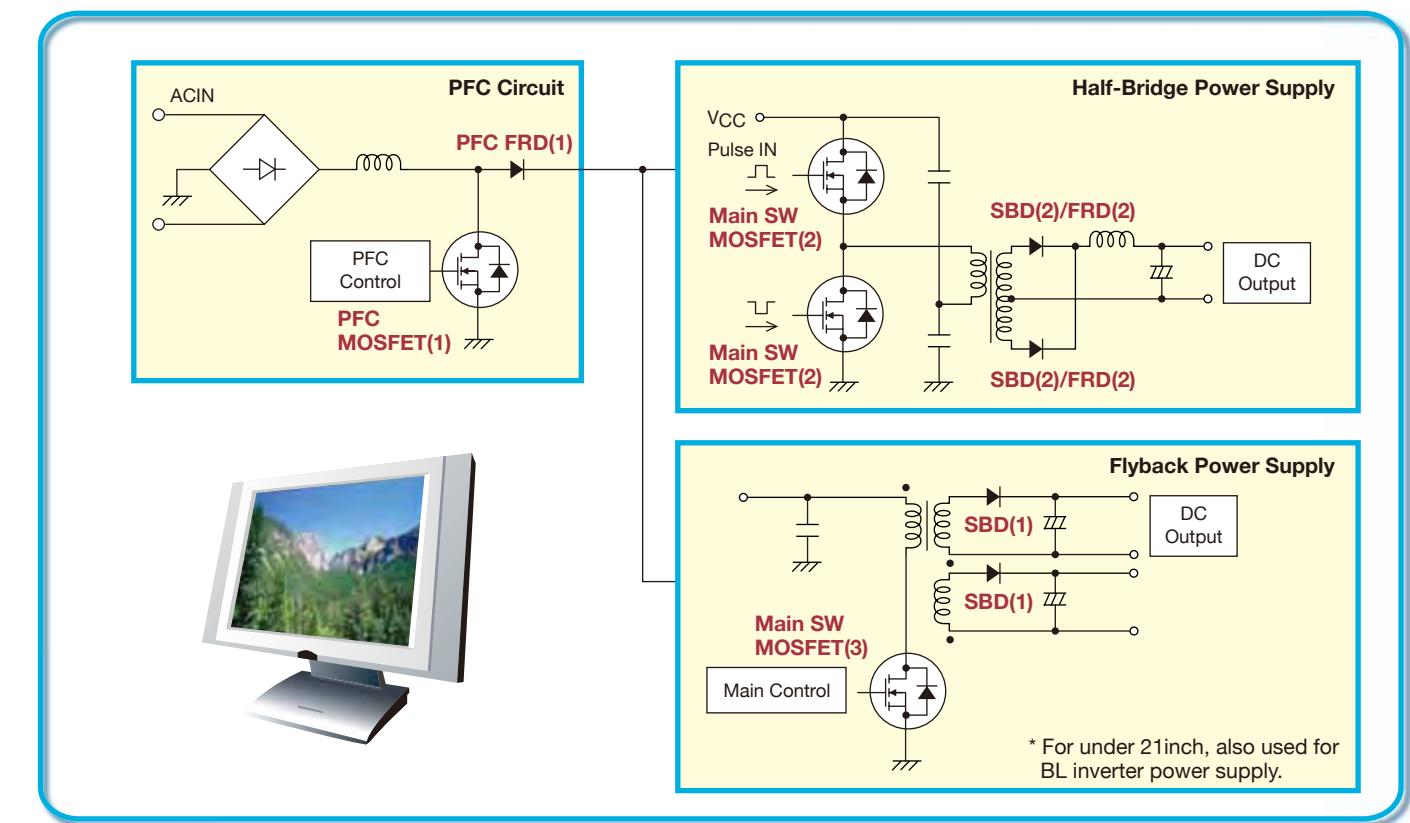
Type No.	Package	Absolute maximum ratings/Ta=25°C			Electrical characteristics/Ta=25°C					Input Voltage [V]	AC Adapter Circuits [W]		
		VCBO [V]	VCEO [V]	IC [A]	hFE		VCE (sat) [V]						
					IC [A]	min	max	IC [mA]	IB [mA]				
2SC5823	TP	700	400	1.5	0.1	20	50	700	140	0.8	100/220	3/6	
2SC5808	TP	700	400	2.5	0.3	20	50	1200	240	0.8	100/220	4/8	
* TT2240NMP	NMP	700	400	1.0	0.1	15	30	500	100	0.8	100/220	1.5/3	
2SC6065-V	NMP	700	400	1.5	0.1	20	50	700	140	0.8	100/220	3/6	
2SC6083	SPA	700	350	1.0	0.1	100	200	500	100	0.8	100	1.5	
2SC6083A	SPA	700	400	1.0	0.1	50	100	500	100	0.8	100/220	1.5/3	
* 2SC6146	SPA	800	350	1.0	0.1	100	200	500	100	0.8	220	3	
CPH3249	CPH3	700	350	1.0	0.1	100	200	500	100	0.8	100/220	1.5/3	
CPH3249A	CPH3	700	400	1.0	0.1	50	100	500	100	0.8	100/220	1.5/3	

*: Development

LCD TV

Recommended Devices by LCD-TV Panel Size

(1) When BL inverter is half-bridge circuit, and AV output is flyback circuit



◆ Lineup

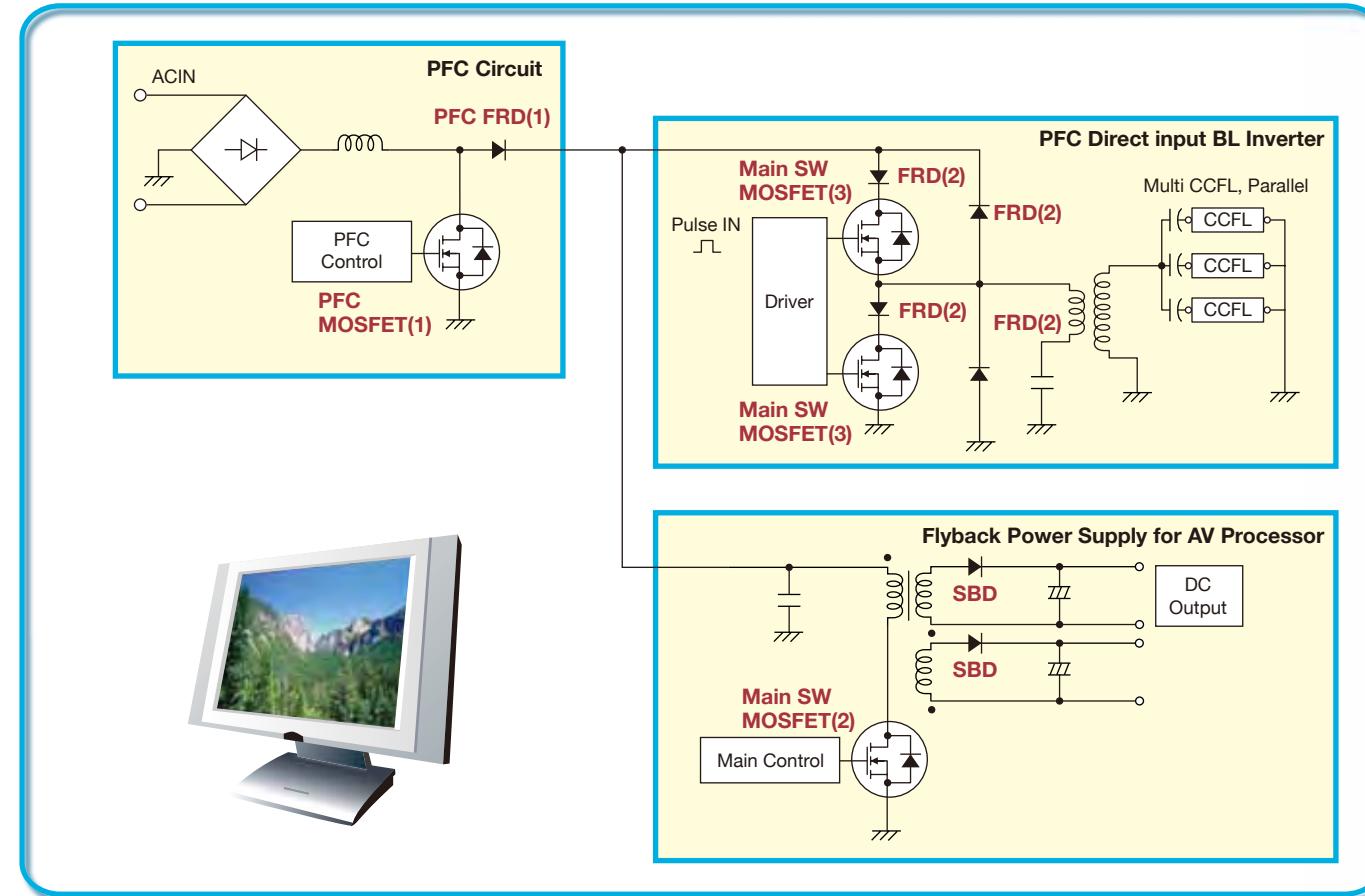
Set Spec			PFC		SPS for AV Processor	SPS for BL Inverter	2nd Rectifier
Panel Size [inch]	POUT [W]	VOUT [V]	FRD(1)	MOSFET(1)	MOSFET(2)	MOSFET(3)	SBD(1) SBD(2)/FRD(2)
up to 21	70	5/12	-	-	2SK4086LS (also used for BL power supply)	-	SBT80-06J(1) SBT100-16JS(1)
26 to 32	150	5 to 12 24	* RD1006LS	2SK4085LS	2SK4098LS	2SK4096LSx2	SBT100-16JS(1) SBT100-16JS(2)
37 to 42	250	5 to 12 24	* RD0506LS	2SK4124x2	2SK4098LS	2SK4097LSx2	SBT100-16JS(1) SBT150-10JS(2)
at least 42	350	5 to 12 24/60	* RD1006LS	2SK4124x3	2SK4101LS	2SK4084LSx2	SBT100-16JS(2) SBT150-10JS(1) RD2004LS(2)

[Power supply block]

- Circuit
 - For under 21inch, used for both AV processor (main power supply) and BL inverter power supply.
 - For larger than 26inch, 2-power supply system is usually used (one is for BL inverter use, and the other is for AV processor use).
- Secondary-side diode voltage
 - In case of flyback circuit, diode voltage should be 100V and above for 12V output (when PFC output is 380V).
 - In case of half-bridge circuit, diode voltage should be 100V and above for 24V output (when PFC output is 380V).

Devices for SW Power Supply

(2) The example when BL inverter adopts PFC voltage direct input circuit, and AV output adopts flyback circuit



◆ Lineup

Set Spec			PFC		Direct BL Inverter		SPS for AV Processor	2nd Rectifier
Panel Size [inch]	POUT [W]	VOUT [V]	FRD(1)	MOSFET(1)	FRD(2)	MOSFET(3)	MOSFET(2)	SBD
26 to 37	200	12	* RD1006LS	2SK4085LS	* RD0506LS	2SK4086LSx2	2SK4098LS	SBT100-16JS
37 to 42	250	12 to 18	* RD1006LS	2SK4124x2	* RD0506LS	2SK4086LSx2	2SK4098LS	SBT100-16JSx2
at least 42	350	12 to 18	* RD1006LS	2SK4124x3	* RD1006LS	2SK4085LSx2	2SK4101LS	SBT100-16JSx2

*: Development

(3) Devices for BL Inverter

1) Recommended Devices for Bridge Circuit

Push-Pull Type

[Feature]

- Compared with half-bridge type, although doubled voltage is needed, meanwhile RDS(on) can be suppressed due to the use of Nch, so a good symmetry can be achieved.
- Because the current capacity is large, multi tubes driving can be made possible, and the needed parts count can be reduced.

Separately-excitation	Package	Polarity	Type No.	Set Size [inch]	VIN [V]
	SMP	Nch	2SK3285 (30V/34mΩ)	21 to 32	up to 12
		Nch	2SK3352 (30V/21mΩ)		15 to 24
		Nch	2SK3816 (60V/41mΩ)		at least 60
		Nch	2SK3818 (60V/18mΩ)		
		Nch	2SK2592 (250V/200mΩ)		
	TO-220ML TO-220FI	Nch	2SK3703 (60V/28mΩ)	at least 32	15 to 24
		Nch	2SK3704 (60V/15mΩ)		
		Nch	2SK2160 (200V/350mΩ)		
		Nch	2SK2161 (200V/250mΩ)		
		Nch	2SK4096 (500V/710mΩ)		
		Nch	2SK4084 (500V/400mΩ)		
	VEC8 (VECxxxx) ECH8 (ECH8xxx) TSSOP8 (FTSxxxx(single)) (FTDxxxx(Dual))	Nch + Nch	VEC2402 (30V/99mΩ)	2.5 to 8	5 to 12
		Nch + Nch	ECH8606 (30V/75mΩ)		
		Nch	ECH8402 (30V/32mΩ)		
		Nch + Nch	FTD8009 (30V/33mΩ)		
		Nch + Nch	ECH8616 (60V/133mΩ)		
	FW241 (30V/150mΩ) FW261 (30V/83mΩ) FW803 (30V/27mΩ) Nch FSS250 (30V/54mΩ) Nch FSS804 (30V/20mΩ) FW808 (30V/37mΩ) FW250 (60V/215mΩ) FW256 (60V/84mΩ) Nch FSS273 (45V/34mΩ) Nch+Nch FW248 (45V/42mΩ)	Nch + Nch	FW241 (30V/150mΩ)	15 to 19	5 to 12
		Nch + Nch	FW261 (30V/83mΩ)		
		Nch + Nch	FW803 (30V/27mΩ)		
		Nch	FSS250 (30V/54mΩ)		
		Nch	FSS804 (30V/20mΩ)		
		Nch + Nch	FW808 (30V/37mΩ)	15 to 24	5 to 12
		Nch + Nch	FW250 (60V/215mΩ)		
		Nch + Nch	FW256 (60V/84mΩ)		
		Nch	FSS273 (45V/34mΩ)		
		Nch+Nch	FW248 (45V/42mΩ)		
	FW248 (45V/42mΩ) Nch FSS275 (60V/62mΩ) Nch + Nch FW257 (100V/220mΩ) Nch + Nch FW225 (450V/11.2Ω)	Nch + Nch	FSS275 (60V/62mΩ)	15 to 24	5 to 12
		Nch + Nch	FW257 (100V/220mΩ)		
		Nch + Nch	FW225 (450V/11.2Ω)		
		Nch	SFT1402 (35V/40mΩ)	at least 32	5 to 12
		Nch	SFT1403 (35V/25mΩ)		
		Nch	2SK3352 (30V/21mΩ)		
		Nch	SFT1407 (45V/29mΩ)		
		Nch	SFT1405 (45V/74mΩ)		
		Nch	2SK3615 (60V/85mΩ)		
		Nch	2SK3816 (60V/41mΩ)		
	TP SMP	Nch	2SK3818 (60V/18mΩ)	15 to 24	5 to 12
		Nch	2SK1920 (250V/700mΩ)		
		Nch	2SK3092 (400V/2.3Ω)		
		Nch	2SK3850 (600V/18.5Ω)		
		Nch	2SK3850 (600V/18.5Ω)		

Devices for SW Power Supply

Full-bridge Type, Half-bridge Type

[Feature: Full-bridge/Half-bridge Type]

- Pch/Nch drive
- A large current device can drive multi tubes, thus the needed parts count can be reduced.

[Feature: Half-bridge Type (High voltage input)]

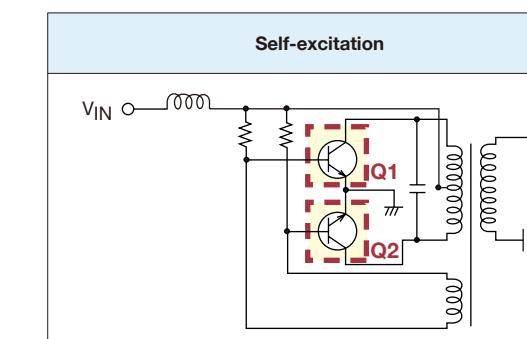
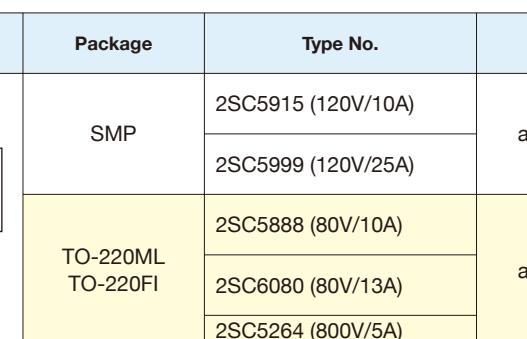
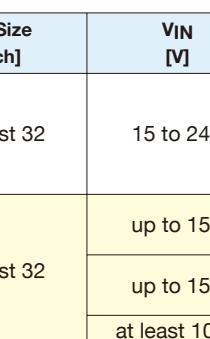
- A highly effective system can be achieved by using a high side driver, which can make the inverter circuit to be operated at a PFC voltage level.
- MOSFET should be Nch type and withstand a high voltage.

Separately-excitation		Package	Polarity	Type No.	Set Size [inch]	VIN [V]	
Full-Bridge	SMP	Nch	2SK3815 (60V/55mΩ)	at least 32	12 to 24	15 to 24V	
			2SJ659 (60V/133mΩ)				
			2SK3819 (100V/130mΩ)		at least 60		
			2SJ664 (100V/136mΩ)				
	TO-220ML TO-220FI	Nch	2SJ3702 (60V/55mΩ)	at least 32	12 to 24	up to 15V	
			2SJ650 (60V/135mΩ)				
		Nch	2SK3706 (100V/130mΩ)		at least 60		
			2SJ655 (100V/136mΩ)				
		Pch	2SK2161 (200V/350mΩ)				
			2SJ405 (200V/500mΩ)				
		Nch	2SK4096 (500V/710mΩ)				
			2SK4084 (500V/400mΩ)				
	VEC8 (VECxxxx) ECH8 (ECH8xxx)	Nch + Pch	VEC2602 (30V/99•168mΩ)	2.5 to 8	5 to 12	up to 15V	
			ECH8609 (30V/75•120mΩ)				
		Nch	ECH8402 (30V/32mΩ)				
			ECH8302 (30V/48mΩ)				
		Pch	ECH8616 (60V/133mΩ)				
			ECH8615 (60V/295mΩ)				
		Nch + Pch	FW344 (30V/150•147mΩ)		5 to 12	up to 15V	
			FW340 (30V/83•98mΩ)				
		Nch + Pch	FW342 (30V/52•98mΩ)				
			Nch FSS802 (30V/26mΩ)				
		Pch	FSS163 (30V/31mΩ)				
			Nch + Pch FW349 (30V/84•106mΩ)				
		Nch + Pch	FW359 (30V/215•205mΩ)		15 to 24	up to 15V	
			Nch FSS273 (45V/34mΩ)				
		Pch	FSS145 (45V/40mΩ)				
			Nch 2SK3351 (30V/21mΩ)	at least 32	5 to 12	up to 15V	
		Pch	2SJ646 (30V/154mΩ)				
			Nch 2SK3285 (30V/34mΩ)		15 to 24		
		Nch	2SK3352 (30V/21mΩ)				
			Nch SFT1402 (35V/69mΩ)		at least 120	up to 15V	
		Pch	SFT1302 (35V/111mΩ)				
			Nch SFT1405 (45V/74mΩ)				
		Pch	SFT1305 (45V/147mΩ)				
			Nch 2SK3615 (60V/85mΩ)				
		Pch	2SJ635 (60V/92mΩ)				
			Nch 2SK3818 (60V/18mΩ)				
		Pch	2SJ662 (60V/38mΩ)				
			Nch 2SK3979 (200V/450mΩ)				
		Pch	2SJ679 (200V/980mΩ)				
			Nch 2SK1920 (250V/700mΩ)				
		Pch	2SJ281 (250V/2Ω)				

Self-excitation Type (collector resonance)

[Feature]

- Multi tubes can be driven by using a power device with large current capacity.
→ also, the number of inverter circuits and used parts can be reduced.
- 4 to 8 tubes can be driven by circuit.
- Best choice for low-cost sets.

Self-excitation		Package	Type No.	Set Size [inch]	VIN [V]
	SMP	2SC5915 (120V/10A)	2SC5999 (120V/25A)	at least 32	15 to 24V
	TO-220ML TO-220FI	2SC5888 (80V/10A)	2SC6080 (80V/13A)	at least 32	up to 15V
	2SC5264 (800V/5A)			at least 100V	

2) Recommended Power MOSFETs & Bipolar Transistors by Monitor Size

Power MOSFET Lineup by Input Voltage and Monitor Size

PCP Package			SOP8 Package			TP Package		
Type No.	V _{DSS} [V]	I _D [A]	Type No.	V _{DSS} [V]	I _D [A]	Type No.	V _{DSS} [V]	I _D [A]
2SK3614	60	4	FW250	60	3	2SK3978	200	4
2SK3944	60	2	FW359	60	3	2SK3977	100	4
2SJ632	60	2	FW248	45	6	SFT1202	180	2
2SK3489	30	8	FW349	45	4	SFT1201	150	2.5
2SK3490	30	8				SFT1305	45	10
2SJ616	30	6				SFT1307	45	14
						SFT1405	45	10
						SFT1407	45	14
						SFT1403	35	11
						SFT1402	35	14

Bipolar Transistor Lineup by Input Voltage and Monitor Size

VEC8 Package			PCP Package			TP Package			SMP Package		
Type No.	V _{CES} [V]	I _C [A]	Type No.	V _{CES} + V _{CBO} [V]	I _C [A]	Type No.	V _{CES} + V _{CBO} [V]	I _C [A]	Type No.	V _{CES} [V]	I _C [A]
VEC2202	120	2.5	PCP1201	150	2.5	2SC6071	120	10	2SC5974	700	7
VEC2201	100	3	PCP120								

Devices for SW Power Supply

(4) Devices for Power MOSFET Buffer

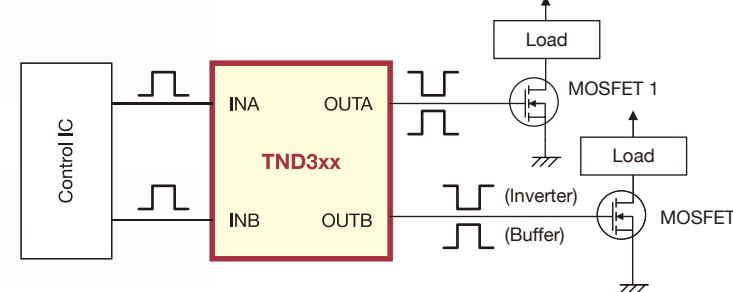
1) Low Side Driver ExPD [MOSFET, IGBT Gate driver IC]

[Application]

- PDP, LCD-backlight, inverter light, liquid crystal projector, HID drive, motor drive, half-bridge/full-bridge power supply, etc.

[ExPD Use Example]

- Withstand voltage of 25V is assured.
- 2 low side drivers in
- TTL/CMOS compatible ($V_{IH}=2.6V$ or less at $V_{DD}=4.5$ to 25V)
- High-speed switching time ($t_r/t_f=typ\ 25ns$, at 1000pF load [TND301S])



ExPDs

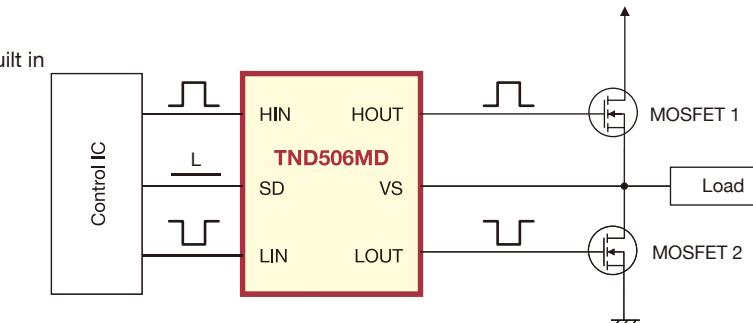
Type No.	Package	Functions	$V_{DD\ max}$ [V]	$P_D\ max$ [W]	Operating voltage range [V]	Drive capability		$V_{IH\ min}$ [V]	$V_{IL\ max}$ [V]
						Source [A]	Sink[A]		
TND321VD	VEC8	Dual inverter	25	0.2	4.5 to 25	0.8	1	2.6	0.8
TND322VD		Dual buffer	25	0.2	4.5 to 25	0.8	1	2.6	0.8
TND323VD		Inverter buffer	25	0.2	4.5 to 25	0.8	1	2.6	0.8
TND307TD	TSSOP8	Dual inverter	25	0.25	4.5 to 25	1	1	2.6	0.8
TND308TD		Dual buffer	25	0.25	4.5 to 25	1	1	2.6	0.8
TND309TD		Inverter buffer	25	0.25	4.5 to 25	1	1	2.6	0.8
TND301S	SOP8	Dual inverter	25	0.3	4.5 to 25	2	2	2.6	0.8
TND302S		Dual buffer	25	0.3	4.5 to 25	2	2	2.6	0.8
TND303S		Inverter buffer	25	0.3	4.5 to 25	2	2	2.6	0.8
TND304S		Dual inverter	25	0.3	4.5 to 25	1	1	2.6	0.8
TND305S		Dual buffer	25	0.3	4.5 to 25	1	1	2.6	0.8
TND306S		Inverter buffer	25	0.3	4.5 to 25	1	1	2.6	0.8
TND311S		Dual inverter	25	0.3	4.5 to 25	2	2	2.6	0.8
TND312S		Dual buffer	25	0.3	4.5 to 25	2	2	2.6	0.8
TND313S		Inverter buffer	25	0.3	4.5 to 25	2	2	2.6	0.8
TND314S		Dual inverter	25	0.3	4.5 to 25	1	1	2.6	0.8
TND315S		Dual buffer	25	0.3	4.5 to 25	1	1	2.6	0.8
TND316S		Inverter buffer	25	0.3	4.5 to 25	1	1	2.6	0.8

* TND30x series: input terminal Hi Z (high impedance); TND31x/TND32x series: input pull-down resistor in.

2) High Voltage Driver ExPD

[ExPD Use Example]

- High withstand voltage driver (600V)
- Under-voltage protection function is built in



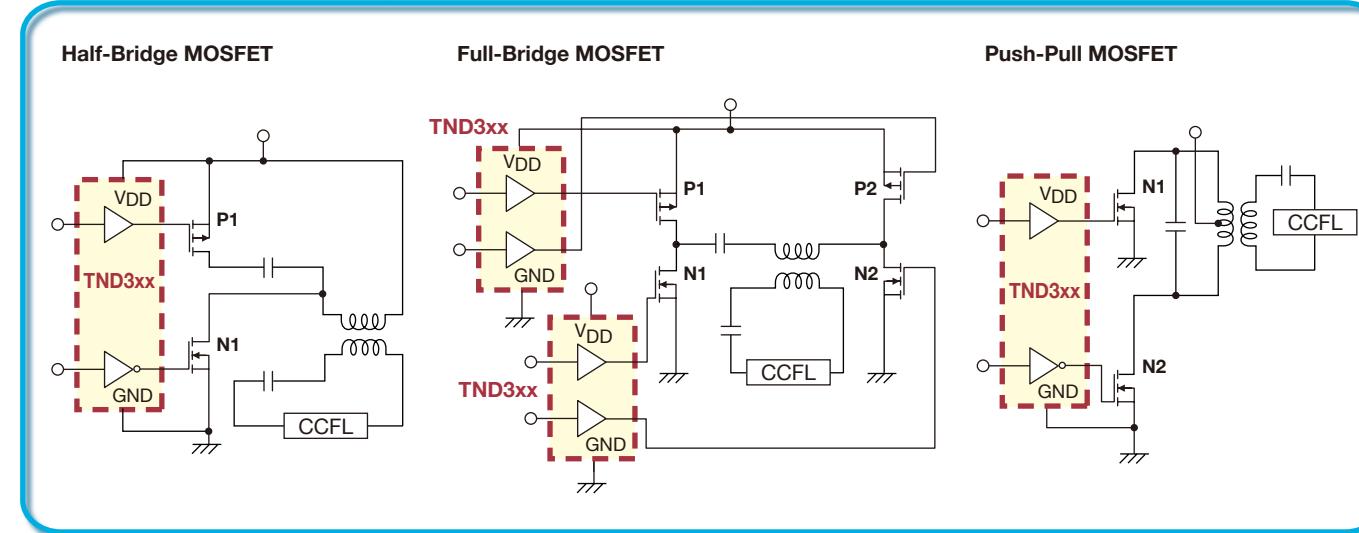
ExPDs

Type No.	Package	V_S [V]	IO		Features	Applications
			Source [mA]	Sink [mA]		
● TND516SS	SOP8	600	200	400	Single-phase high side driver	Ballasts, PDP maintenance drive, DC/AC motor drive, induction heaters, charging circuits, high-frequency switching power supplies, switching amplifiers, and other general-purpose driver applications
TND507S		600	250	500	Single input/two output half bridge driver circuits	
TND508S		600	250	500		
● TND512MD	MFP16	600	200	400	3-phase high side driver	3-phase motor drive application
TND505MD		600	250	500	Two input/output half bridge driver circuits. Built-in shutdown function and low-side priority circuit.	DC/AC motor drive, ballasts, charging circuits, high-frequency switching power supplies, induction heaters, switching amplifiers, and other general-purpose driver applications
TND506MD		600	250	500	Two input/output half bridge driver circuits. Built-in shutdown function.	

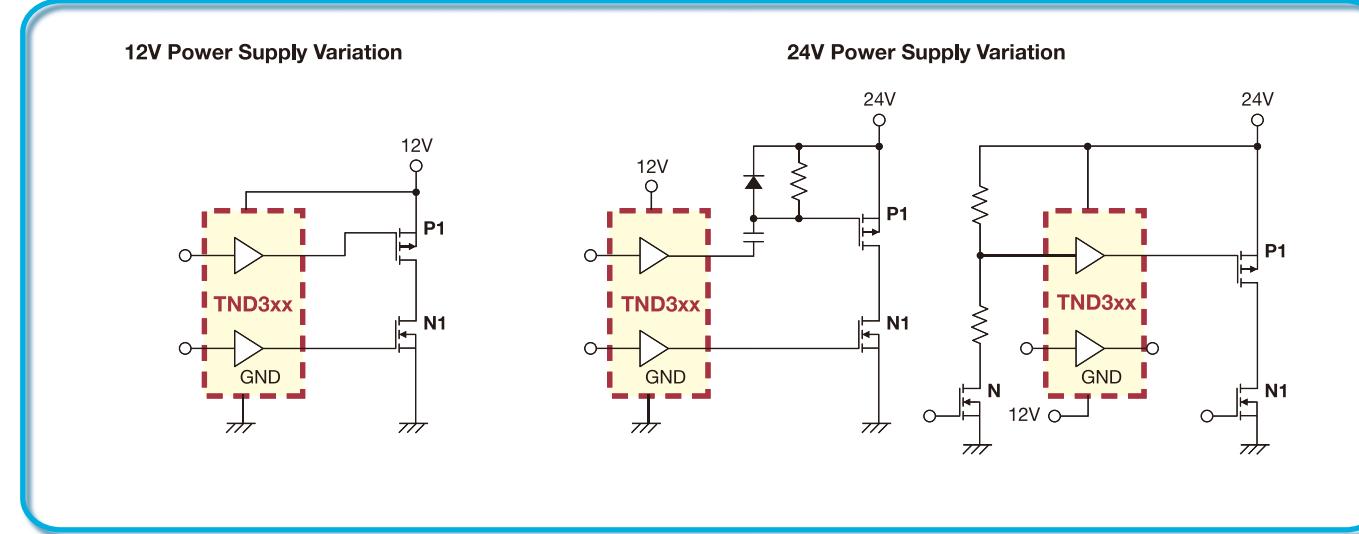
Devices for SW Power Supply

3) LCD-Backlight Inverter: ExPD

[TND3xx Use Example: MOSFET Driver]

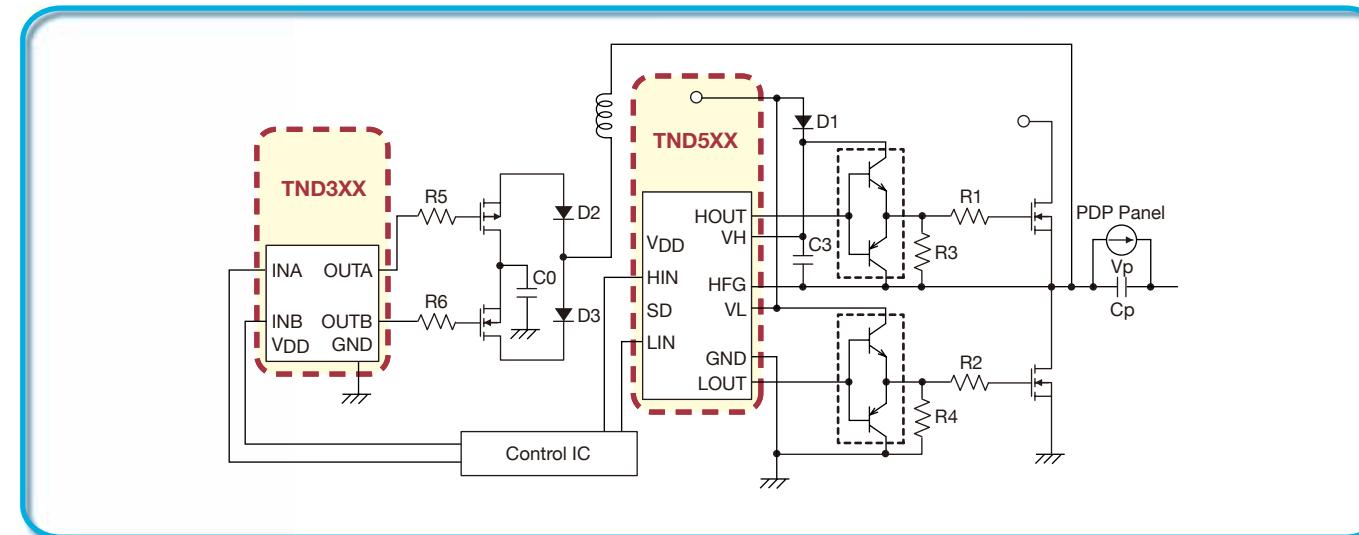


[TND3xx Use Example: High-side FET Drive, Various Applications]



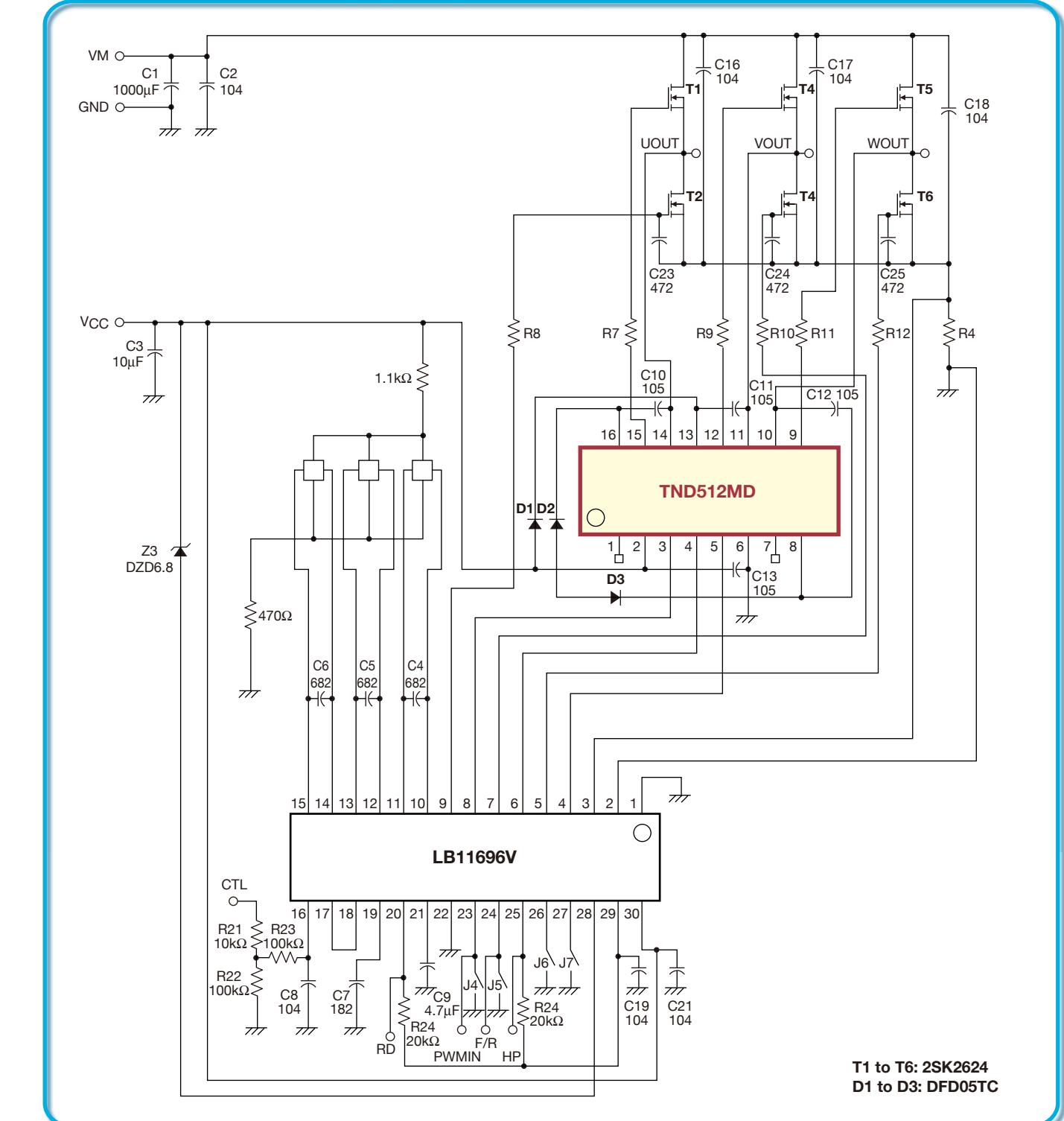
4) PDP Sustain Driver: ExPD

[TND5xx, TND3xx Use Example]



5) Air conditioner fan motor drive: ExPD

[TND512MD Use Example]

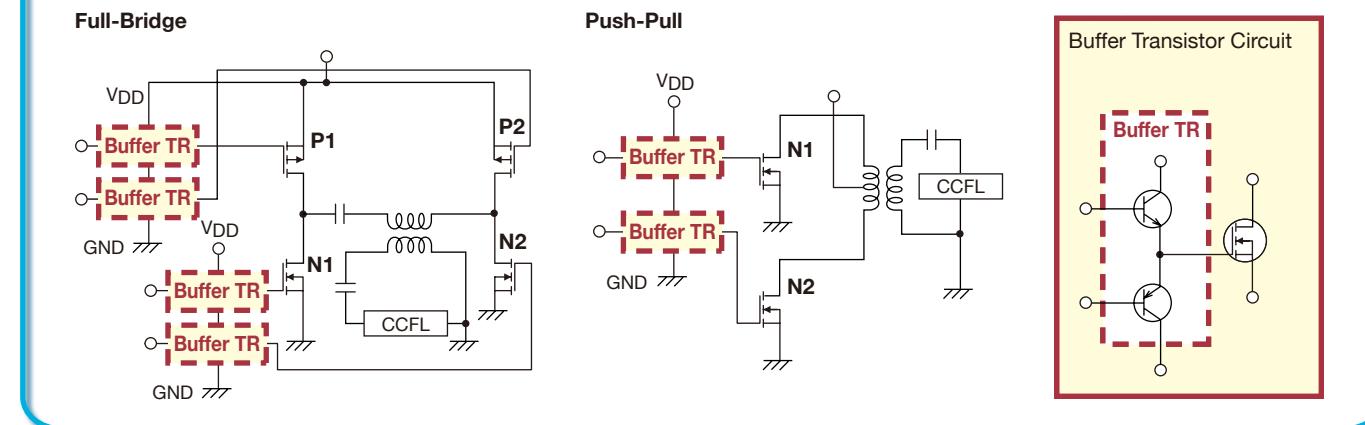


Devices for SW Power Supply

6) Bipolar Transistors: Separately-excited Inverter (MOSFET for Gate Drive)

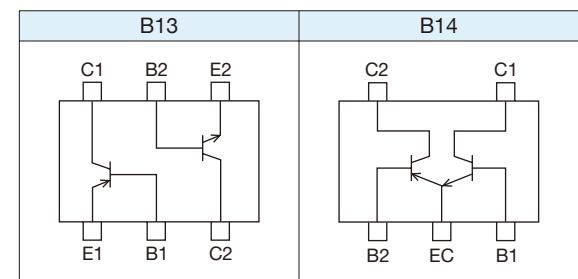
[Bipolar Transistor Use Example]

- IC with large IC is recommended for driving large-capacitance MOSFET
- Composite type (PNP+NPN) is recommended for miniaturization purpose



Bipolar Transistors

Type No.	Package	Polarity	Absolute maximum ratings/Ta=25°C				Electrical characteristics/Ta=25°C						Internal chip equivalent product	Electrical connection		
			VCEO [V]	IC [A]	ICP [A]	PC [W]	VCE [V]	IC [A]	min	max	IC [A]	IB [mA]	typ	max		
MCH5541	MCPH5	PNP	30	0.7	3	0.5	2	0.01	200	500	0.2	10	0.11	0.22	30A02MH +30C02MH	B14
		NPN	30	0.7	3	0.5	2	0.05	300	800	0.2	10	0.085	0.19		
MCH6542	MCPH6	PNP	30	0.3	0.9	0.5	2	0.01	200	500	0.1	5	0.11	0.22	30A01M +30C01M	B13
		NPN	30	0.3	0.9	0.5	2	0.01	300	800	0.1	5	0.1	0.2		
MCH6545		PNP	50	0.5	1	0.5	2	0.01	200	500	0.1	10	0.06	0.12	50A02CH +50C02CH	B13
		NPN	50	0.5	1	0.5	2	0.01	300	700	0.1	10	0.05	0.1		
CPH5541	CPH5	PNP	30	0.7	3	0.6	2	0.01	200	500	0.2	10	0.11	0.22	30A02CH +30C02CH	B14
		NPN	30	0.7	3	0.6	2	0.05	300	800	0.2	10	0.085	0.19		
CPH5506		PNP	30	1.5	5	0.9	2	0.1	200	560	0.75	15	0.25	0.375	CPH3115 +CPH3215	B14
		NPN	30	1.5	5	0.9	2	0.1	200	560	0.75	15	0.15	0.225		
CPH5516		PNP	30	2	6	0.9	2	0.1	200	560	1.5	75	0.17	0.26	CPH3144 +CPH3244	B14
		NPN	30	2	6	0.9	2	0.1	200	560	1.5	75	0.16	0.24		
CPH5518		PNP	50	1	3	0.9	2	0.1	200	560	0.5	10	0.23	0.38	CPH3116 +CPH3216	B14
		NPN	50	1	3	0.9	2	0.1	200	560	0.5	10	0.13	0.19		
CPH5524		PNP	50	3	6	0.9	2	0.1	200	560	1	50	0.115	0.23	CPH3123 +CPH3223	B14
		NPN	50	3	6	0.9	2	0.1	200	560	1	50	0.09	0.13		



■ DC-DC Converter IC

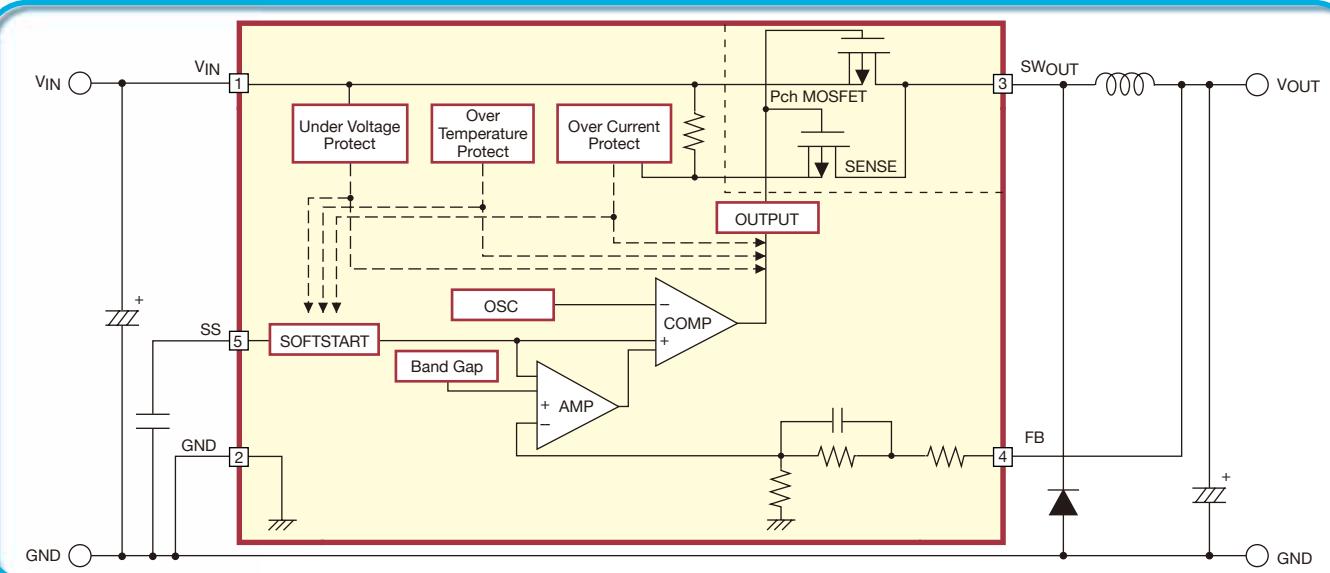
TN8D41A/51A, TN5D41A/51A/61A: Separately-excited step-down switching regulator

[Functions/Features]

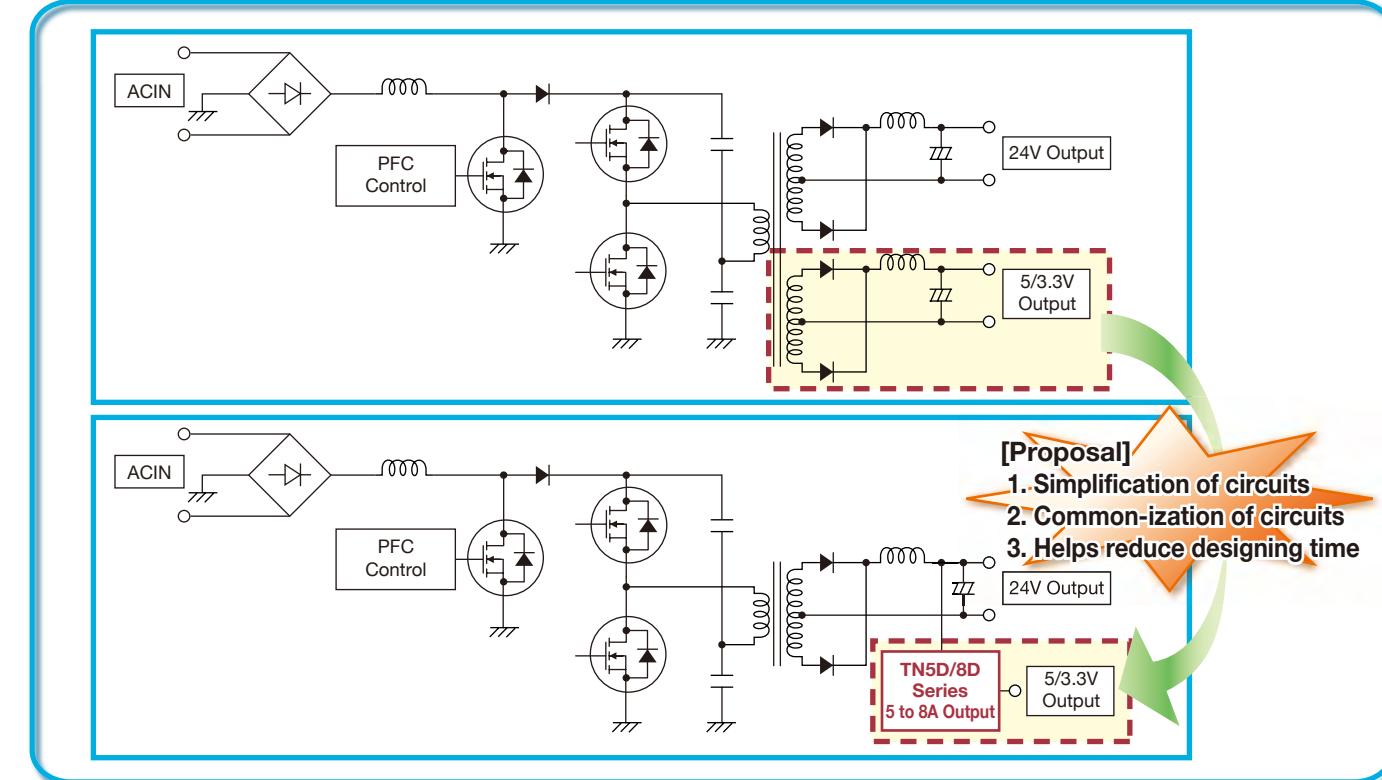
- Large current I_O max 8A (TN8D41A/51A)
- High efficiency Vertical-type P-channel power MOSFET built-in
- High withstand voltage V_{IN} max 57V
- Five external parts
- Built-in reference oscillator (150kHz)
- Built-in current limiter
- Built-in thermal shutdown circuit
- Built-in soft start circuit
- ON/OFF function (shared with soft start pin)

Type No.	Type	Input voltage	Output voltage/current	Channels	Power stage	Package
TN5D41A	Step-down	10V to 40V	5V/5A	1ch	Built-in (PMOS)	TO-220FI5H-HB
TN8D41A	Step-down	10V to 40V	5V/8A	1ch	Built-in (PMOS)	TO-220FI5H-HB
TN5D51A	Step-down	20V to 48V	12V/5A	1ch	Built-in (PMOS)	TO-220FI5H-HB
TN8D51A	Step-down	20V to 48V	12V/8A	1ch	Built-in (PMOS)	TO-220FI5H-HB
TN5D61A	Step-down	30V to 48V	24V/5A	1ch	Built-in (PMOS)	TO-220FI5H-HB

[ExPD Use Example]



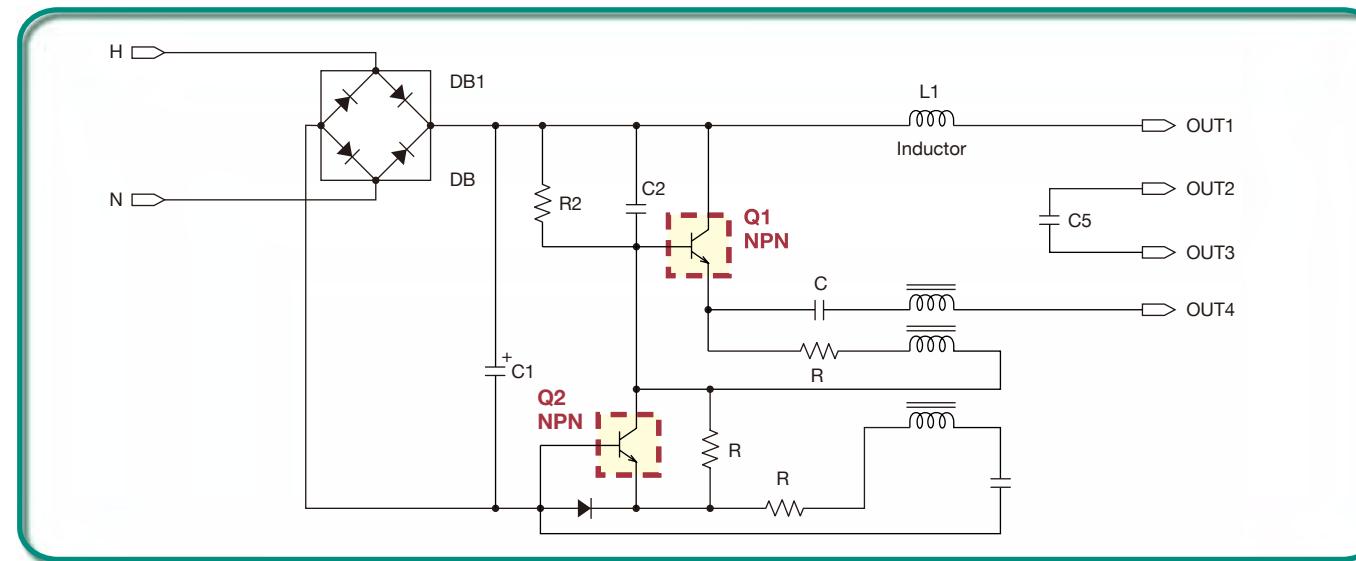
[Application Example for Power Supply Makers: Allows High Design Freedom]



Devices for Lighting

Inverter light

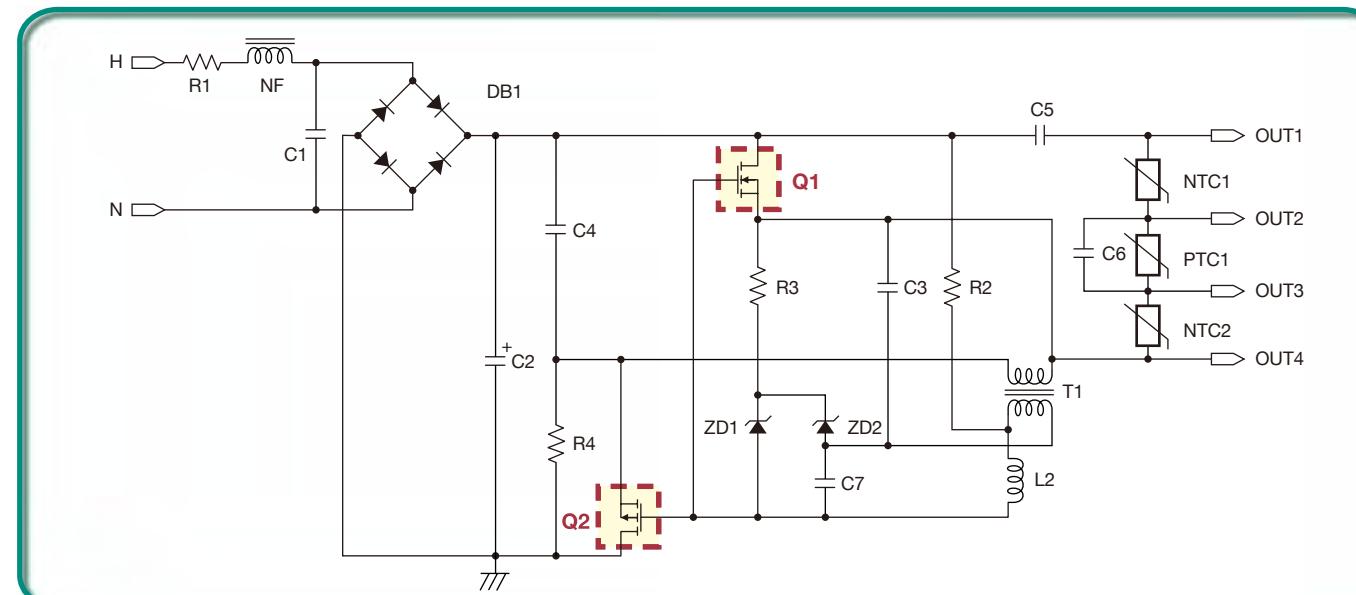
[Bipolar Transistor Use Example: Ball Lamp]



Bipolar Transistors

Type No.	Package	Polarity	Absolute maximum ratings/Ta=25°C			Electrical characteristics/Ta=25°C						Merit	Set power [W]		
			VCBO [V]	VCEO [V]	IC [A]	hFE1			hFE2						
						VCE [V]	IC [A]	min	max	VCE [V]	IC [A]				
TT2264	SPA	NPN	700	400	0.3	5	0.03	50	100	5	0.15	at least 10	hFE of low current side is high	up to 20	
2SC6083A		NPN	700	400	1	5	0.1	50	100	5	0.5	at least 10	hFE of low current side is high, package is small	20 to 60	
TT2240NMP	NMP	NPN	700	400	1	1	0.1	15	30	5	0.5	at least 10	Package is small	20 to 60	
TT2188	TO-220	NPN	500	400	5	5	0.5	20	50	5	3	at least 10	tf=0.3μs	20 to 60	
TT2146		NPN	500	400	8	5	0.8	20	50	5	4	at least 10	tf=0.3μs	65 to 130	
TT2196		NPN	500	400	12	5	1.2	20	50	5	6	at least 10	tf=0.3μs		

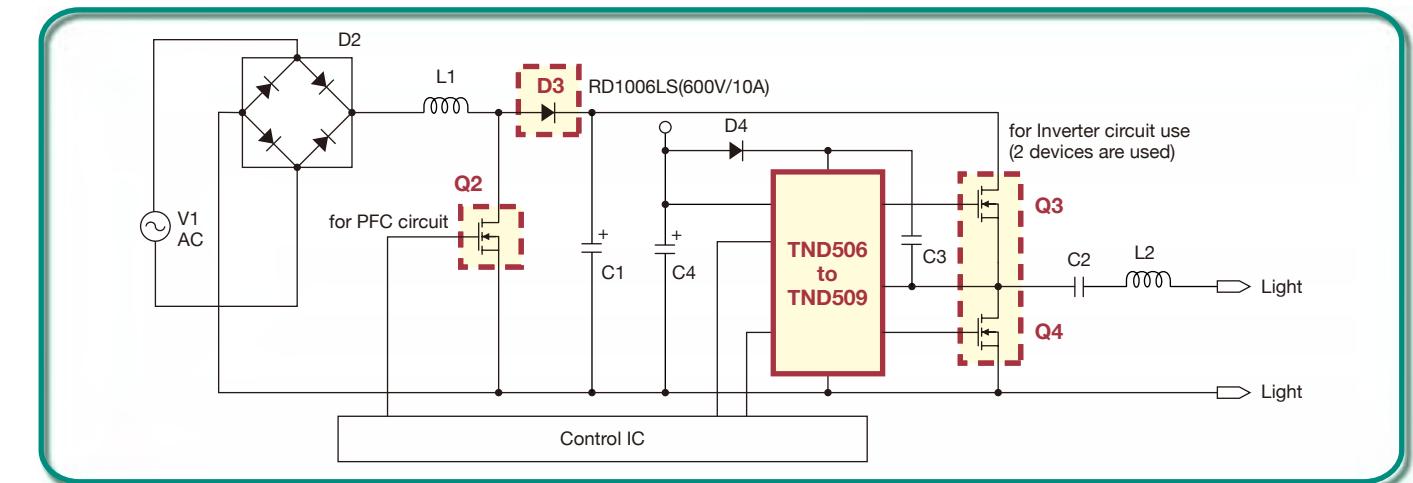
[MOSFET Use Example: Ball Lamp]



MOSFETs

Type No.	Package	Polarity	Absolute maximum ratings/Ta=25°C				Electrical characteristics/Ta=25°C				●: New products	
			V _{DSS} [V]	V _{GSS} [V]	I _D [A]	P _D [W]	R _{D(S)} (on) [Ω]		C _{iss} [pF]	Q _g [nC]		
							V _{GS} =10(15)V typ	V _{GS} =10(15)V max	V _{GS} =4(5)V typ	V _{GS} =4(5)V max		
2SJ281	PCP	Pch	250	30	3	30	1.5	2	-	-	420	-
● 2SK3979		Nch	200	30	6	20	0.32	0.45	-	-	1090	18.2
2SK1920		Nch	250	30	4	30	0.5	0.7	-	-	420	-

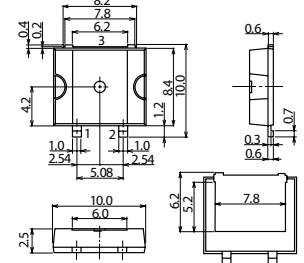
[MOSFET Use Example]



Recommended Devices and Spec: Surface Mount Type

Recommended devices by inverter lighting set [AC=200V input]

Set output (Fluorescent tube) [W]	PFC circuit	Inverter circuit	Remarks	
			2SK4136x2 2SK4181x2	2SK4136x2 2SK4181x2
32×2	2SK4136x2 2SK4181x2	2SK4136x2 2SK4181x2	525V device is recommended when a larger margin is needed.	
40×2	2SK4137x2 2SK4182x2	2SK4136x2 2SK4181x2	[ZP Package] • good surface radiation due to thin body PD up better radiation than that of SMP package. 10% PD up.	[ZP Package] • good surface radiation due to thin body PD up better radiation than that of SMP package. 10% PD up.
86×2	2SK4138x2 2SK4183x2	2SK4138x2 2SK4183x2		



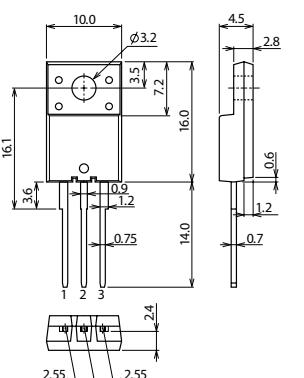
MOSFETs

Type No.	Package	Absolute maximum ratings/Ta=25°C				Electrical characteristics/Ta=25°C				●: New products	
		V _{DSS} [V]	V _{GSS} [V]	I _D [A]	P _D Tc=25°C [W]	R _{D(S)} (on) [Ω]		V _{GS} =10(15)V typ	V _{GS} =10(15)V max		
						R _{D(S)} (on) [Ω]	V _{GS} =10(15)V typ				
● 2SK4136	ZP	500	30	8	70	0.65	0.85	600			
● 2SK4137		500	30	9.5	80	0.5	0.65	750			
● 2SK4138		500	30	14	100	0.4	0.52	1000			
● 2SK4181		525	30	7.5	70	0.71	0.92	600			
● 2SK4182		525	30	9	80	0.58	0.75	750			
● 2SK4183		525	30	13	100	0.45	0.58	1000			

Recommended Devices and Spec: Lead Type

Recommended devices by inverter lighting set [AC=200V input]

Set output (Fluorescent tube) [W]	PFC circuit	Inverter circuit	Remarks	
			2SK4186LSx2	2SK4198LSx2
40×2			[TO-220FI(LS) Package]	[TO-220FI(LS) Package]
86×2	2SK4186LSx2	2SK4199LSx2		
86×3	2SK4187LSx2	2SK4187LSx2		



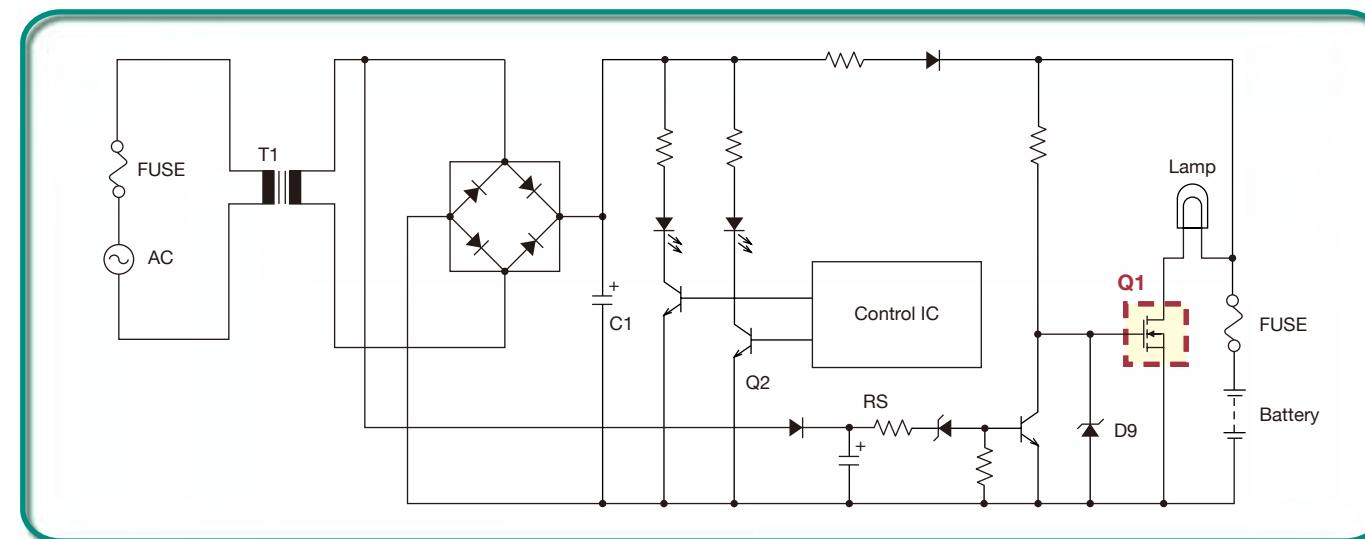
MOSFETs

Type No.	Package	Absolute maximum ratings/Ta=25°C				Electrical characteristics/Ta=25°C				●: New products
V_{DSS} [V]	V_{GSS} [V]	I_D [A]	P_D Tc=25°C [W]	R_{D(S)} (on) [Ω]		V_{GS}=10(15)V typ	V_{GS}=10(15)V max	C_{iss} [pF]	Q_g [nC]	
R_{D(S)} (on) [Ω]	V_{GS}=10(15)V typ									
<

Devices for Lighting

■ Emergency Lamp

[2SK4043LS Use Example]

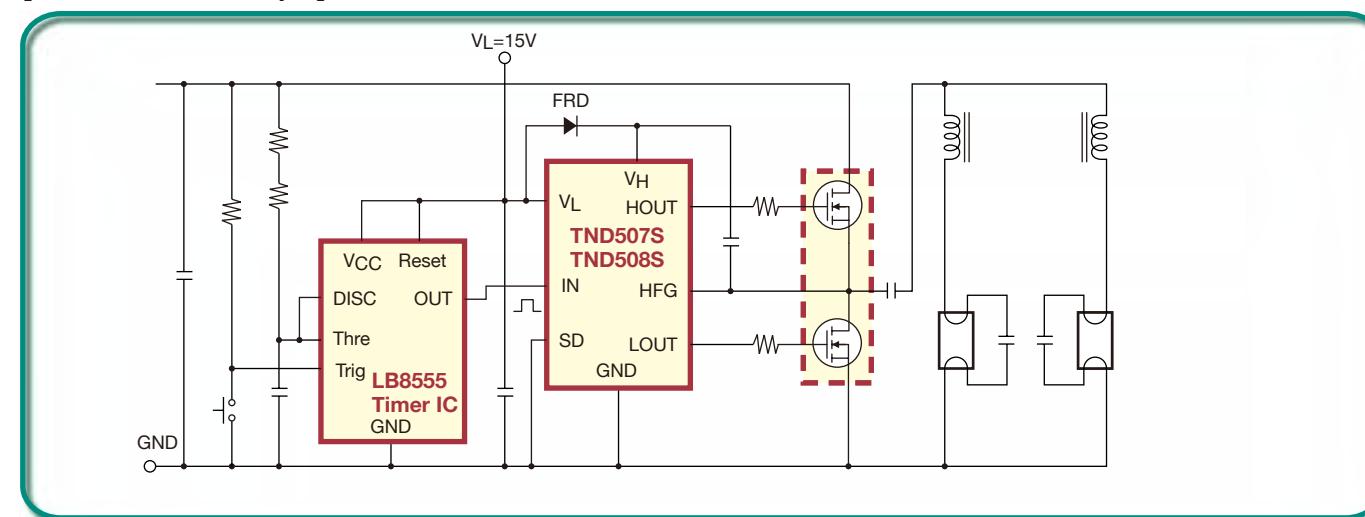


MOSFETs

Type No.	Package	Absolute maximum ratings/Ta=25°C				Electrical characteristics/Ta=25°C				Ciss [pF]	Qg [nC]		
		V _{DSS} [V]	V _{GSS} [V]	I _D [A]	P _D Tc=25°C [W]	R _{DS(on)} [Ω]		V _{GGS} =2.5V typ	V _{GGS} =4V max				
		typ	max	typ	max	typ	max						
● 2SK4043LS	TO-220FI(LS)	30	10	20	20	0.016	0.021	0.017	0.024	3000	37		

■ HID Lamp

[MOSFET Use Example]



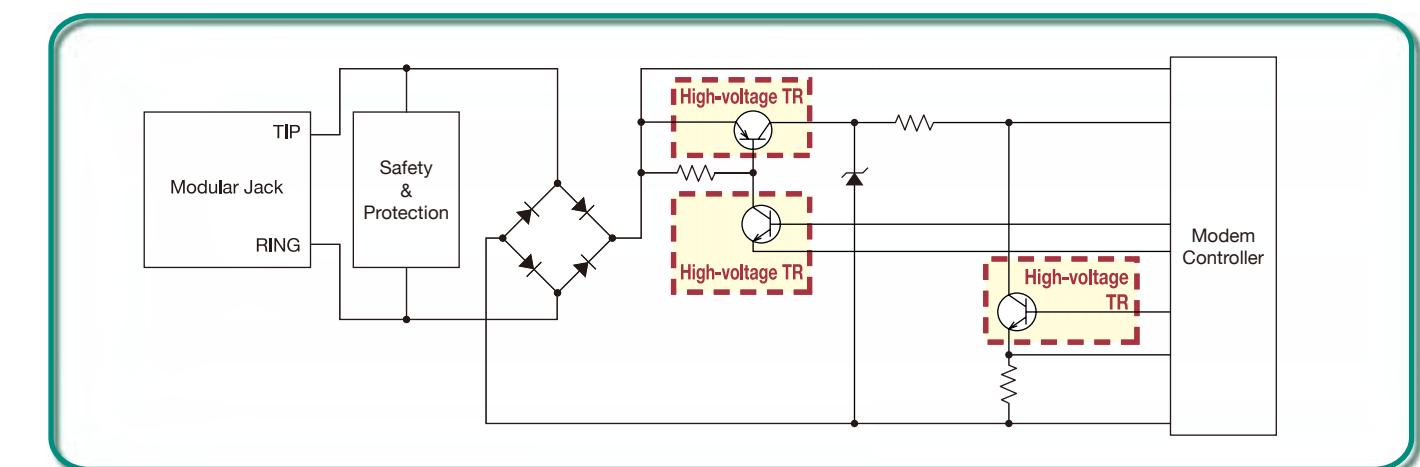
MOSFETs

Type No.	Package	Absolute maximum ratings/Ta=25°C				Electrical characteristics/Ta=25°C				Ciss [pF]	Qg [nC]		
		V _{DSS} [V]	V _{GSS} [V]	I _D [A]	P _D Tc=25°C [W]	R _{DS(on)} [Ω]		V _{GGS} =10(15)V typ	V _{GGS} =10(15)V max				
						typ	max						
● 2SK4136	ZP	500	30	8	70	0.65	0.85	600	-				
● 2SK2617ALS	TO-220FI(LS)	500	30	5	25	1.2	1.6	550	15				
● 2SK2618ALS		500	30	6.5	30	0.95	1.25	700	20				
● 2SK2625ALS		600	30	5	30	1.5	2	700	20				
● 2SK4098LS		600	30	7	33	0.9	1.1	660	-				

Devices for Modem and Infrared Sensor

■ Devices for Modem

[High-Voltage Transistor Use Example for MODEM Circuit]



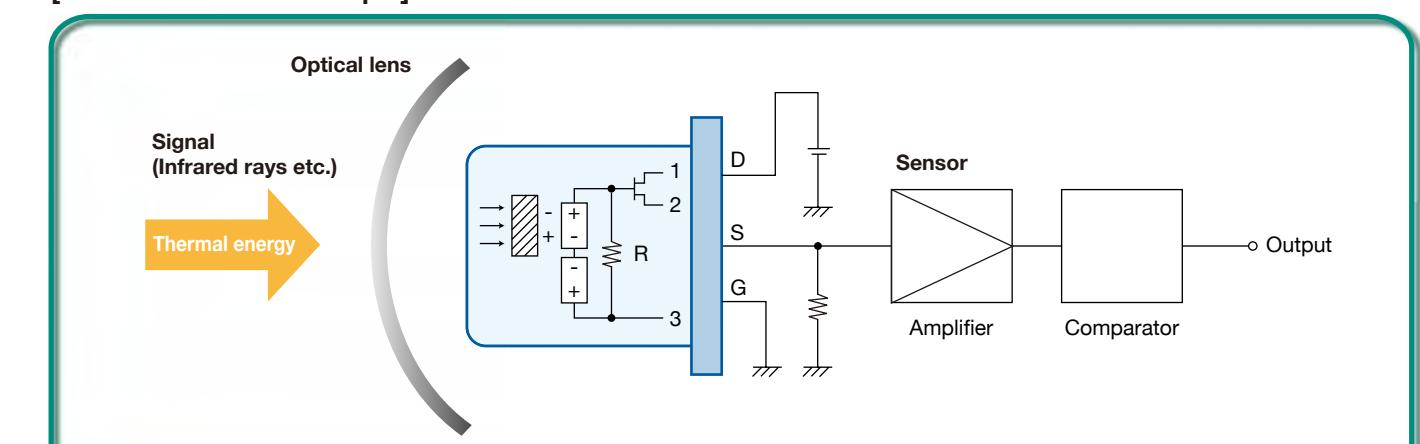
Transistors for Modem Circuit

Type No.	Package	Polarity	Absolute maximum ratings/Ta=25°C			Electrical characteristics/Ta=25°C					
			V _{CBO} [V]	I _C [A]	P _C [W]	h _{FE}		f _T typ [MHz]	V _{CE(sat)} [V]		
min	max	min	min	max	min	max	IC [mA]	IB [mA]	max		
2SA1740	PCP	PNP	400	0.2	1.3	60	200	70	50	5	0.8
2SA1699	NP	PNP	400	0.2	0.6	60	200	70	50	5	0.8
2SA1785	NMP	PNP	400	1	1	40	200	50	200	20	1
● CPH3249A	CPH	NPN	400	1	0.6	50	100	20	10	100	0.8
2SC4548	PCP	NPN	400	0.2	1.3	60	200	70	50	5	0.6
2SC4002	NP	NPN	400	0.2	0.5	60	200	70	50	5	0.6
SOP8501	SOP8	PNP	400	1	1.3	40	200	70	0.2	20	1
		NPN	400	0.2	1.3	60	200	70	0.05	5	0.6

*1: When mounted on ceramic substrate (250mm²×0.8mm)

■ Devices for infrared sensor

[Junction FET Use Example]



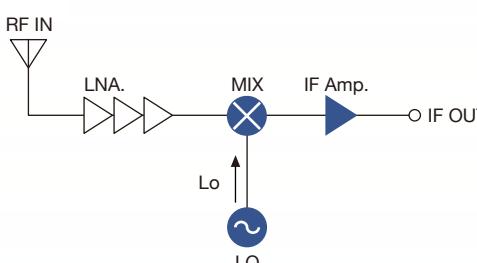
Junction FET

Type No.	Package	Absolute maximum ratings/Ta=25°C				Electrical characteristics/Ta=25°C				Typical Applications	
		V _{DSX} [V]	V _{GDS} [V]	I _D [mA]	P _D [mW]	I _{DSS} typ [mA]	y _{fs} typ [mS]	C _{iss} typ [pF]	C _{rss} typ [pF]		
min	max	min	max	min	max	min	max	min	max		
● EC3A04B	ECSP1006-3B	30	30	10	100	0.6	3	5	4	1.1	humanbody detection, temp. detection, automatic switching, etc.

Satellite LNB

[Satellite LNB]

Frequency: 9 to 14GHz



Ultrahigh-Frequency Transistors

Type No.	Package	Absolute maximum ratings/Ta=25°C			Electrical characteristics/Ta=25°C						Block
		VCEO [V]	IC [mA]	PC [mW]	fT typ [GHz]	f typ [GHz]	NF typ [dB]	f [GHz]	VCE [V]	IC [mA]	
MCH4009	MCPH4	3.5	40	120	25	2	1.1	2	3	20	17 Lo/IF Amp.
MCH4011		3.5	100	350	24	2	1.1	2	3	50	14.5 Lo/IF Amp.
MCH4012		3.5	200	500	20	2	1.0	2	3	100	12 Lo/IF Amp.
MCH4020		8	150	500	16.5	2	1.2	1	5	50	17.5 Lo/IF Amp.

High-Frequency Schottky Barrier Diodes

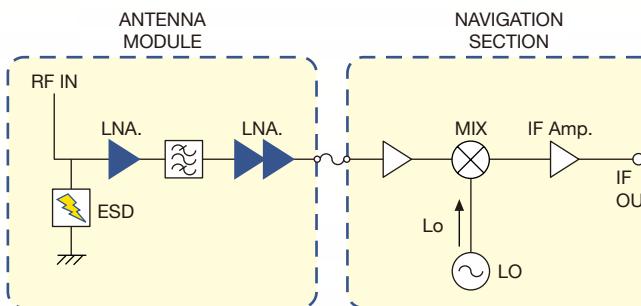
●: New products

Type No.	Package	Absolute maximum ratings/Ta=25°C			Electrical characteristics/Ta=25°C			Block
		VR [V]	IF [mA]	P [mW]	VF [mV]	Conversion Loss [dB]	C typ [pF]	
SBX201C	CP	2	50	-	280	8.6	0.25	Mixer

GPS/XM Antenna Module

[GPS/XM Antenna Module]

Frequency: 1.57 to 2.3GHz

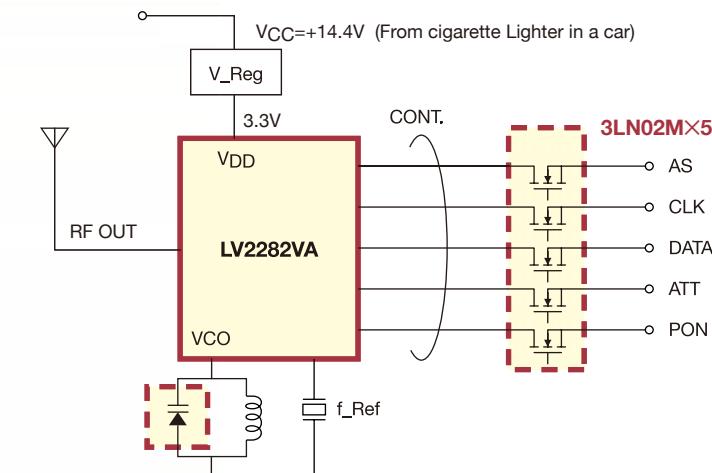


High-Frequency Transistors

Type No.	Package	Absolute maximum ratings/Ta=25°C			Electrical characteristics/Ta=25°C						Block
		VCEO [V]	IC [mA]	PC [mW]	fT typ [GHz]	f typ [GHz]	NF typ [dB]	f [GHz]	VCE [V]	IC [mA]	S21e ² typ [dB]
MCH4009	MCPH4	3.5	40	120	25	2	1.1	2	3	20	17 LNA
MCH4011		3.5	100	350	24	2	1.1	2	3	50	14.5 LNA
MCH4012		3.5	200	500	20	2	1.0	2	3	100	12 LNA
MCH4013		3.5	15	120	22.5	2	1.5	2	5	5	16 LNA
EC4H08C	ECSP1008	3.5	15	50	24	2	1.5	2	3	10	17 LNA
EC4H09C		3.5	40	120	26	2	1.3	2	3	20	16.5 LNA

FM Transmitter

[Varactor Diode Use Example]



Varactor Diode

Type No.	Package	Absolute maximum ratings/Ta=25°C		Electrical characteristics/Ta=25°C						Block
		VR [V]	VR [V]	C1		C2		ΔCm [%]		
		min	max	min	max	min	max			
EC2C01C	ECSP1008-2	15	1	18.5	21.5	4	3.5	4.5	5.0	
SVC710	MCPH3	15	1	18.5	21.5	4	3.5	4.8	4.8	
SVC707	SPA	15	1	18.58	21.26	4	3.61	4.73	3.0	

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